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Points We Consider in Granting Credit

By J. L. Osgood

President of the J. L. Osgood Co., Buffalo, N. Y.

MY VIEWPOINT on credits may differ somewhat from that of most credit men because of the fact that I am the owner of the firm I represent and when I pass on credits I am taking chances entirely with my money. It is possible that if I employed a credit manager instead of adding that responsibility to my duties as I do now, I might not permit him to approve such types of risks that I pass—I am not certain. I do know that I have been acting in my capacity of credit manager for myself so many years that my judgment in such matters has become partly instinctive.

It is probable that certain factors influencing me in granting credits would look too uncertain if presented by another in my employ. Naturally, a case built up by the applicant for credit would lose somewhat of its strength if presented to me through a second party because of the latter's inability to express in cold words and figures such intangibles as his honesty and the sincerity that may ring in a man's voice or the look of unbeatable determination to succeed that may gleam in his eye.

I have indicated that financial statements are not the all-powerful factor with me that they are with most credit men. Figures can lie. Even when they are honest they are subject to a hundred factors that may throw them off, but a man's character cannot lie to a man who makes a conscientious and life-long study of human nature. When I am talking with an applicant for credit, I want to know first of all whether he has the qualities which make up a well balanced business man, which insure ultimate success regardless of the obstacles he may have to overcome. No matter how well financed a business may be in the beginning, 75 per cent of all those who start will fail in the end because of faulty and unbalanced judgment.

A financial statement is an indication of what a man has been able to do in the past and what he is today, but it is the future in which we are interested. It sometimes happens that financial losses early in a man's career are only costly lessons that keep him in the straight and narrow path in the future. Some men are licked by these losses and others form character through them.

> Balance sheets mean less in granting credit than a study of the character and activities of the applicant. Figures can lie but a man's character cannot. One who has never been in business and knows nothing about it may be a potentially successful business man whose good will and friendship will prove invaluable

A man came to me several years ago from a well known firm of lens manufacturers in a distant city where he was employed. Some people who were familiar with my views on credits recommended to him that he come to me. This man had invented a camera shutter and had made one by hand. When I began asking him questions about it his enthusiasm ran away with him and he sold himself both on his product and his ability. I questioned him as to his business experience and found he had never even signed a check. Naturally, he had no credit or balance sheet to show, because he had never been in business for himself, but I gave him the credit he needed, several thousand dollars worth of machinery and supplies, along with some advice as to the management of his business affairs, all of which he was eager to receive and determined to follow. You can't teach an old dog new tricks and it's easier to get a man who has had little or no business experience to adopt safe and proper methods in the conduct of his affairs than it is to correct someone who has been in business several years and whose past methods have been faulty.

He made a small beginning in his own home and when the business had grown sufficiently to warrant it, a small building was erected and more equipment in-

stalled. Today his business is one of the finest small manufacturing establishments of which I know. Its profits are large and there hasn't been a year since it started that the business hasn't paid. It is built on sound principles. This man is still our customer and we have sold him many times the amount of his first order.

That brings me to a point I wish to stress—the cumulative value of the good will that comes from granting credit to men whose security or financial statement would not warrant a great deal. When you help such a man to make his start you make a lifelong friend and customer for your firm. Once such a man has achieved success, his business comes to you very easily and with lessened sales cost.

There have been times when it would have been difficult for us to have continued profitably in business had it not been for the accumulated good will we possessed. Without something of this sort no firm is in a position to stand a continued slump in its line of business, especially when it comes during a general financial depression.

Enthusiasm a Big Factor

I have touched on enthusiasm. This is a big factor with me in granting credit. If a man honestly loves the business he is in or proposes to enter he is at least in a position to succeed. No matter what his ability or knowledge I don't want to gamble much money on the chances of a man's coming through if he isn't intensely interested in the drudgery of the daily task he must face for years in the future. The smallest and most humdrum feature of it must be as absorbing to him as a detective thriller might be to another.

One firm to which I had granted quite a line of credit began going bad several years ago. I suspected the general manager and so started making a study of his methods. This man was one of those high-power efficiency experts who believe in rushing through the most important matters of business and leaving all small details to underlings, chiefly to give himself more time for golf and motoring. The firm asked for a friendly receivership and one of the recommendations I made and which was carried out was that this general manager be replaced by his assistant. The assistant was a quiet plodder with every detail of the business at his finger tips, a man who was never happier than when buried under a mass of work. The added responsibility and fear of making bad mistakes would insure that attention to even the smallest details which seemed necessary to effect the economies required to turn that firm's red figures into black.

Sales suffered somewhat at first because the new manager was so immersed in matters of production and economy, but when a few months later the firm showed a real profit for the first time in years, we felt that temporarily, at least, sales were not the most important end of the business.

From the beginning of an interview I try to determine in various ways whether a man is innately honest. Personally I depend somewhat on the man's attitude during the first talk. Does he look me straight in the eye? Is his conversation straightforward and unreserved, or does he seem cautious, afraid that what he may say will be damaging to his cause? Does he contradict himself as he goes along? But I realize that these qualities can perhaps be cultivated by one who has natural histrionic abilities and so I do not depend too much on such observations. I insist on asking a man a lot of somewhat personal questions, queries he would not be likely to expect of me and I feel that I can judge somewhat of his honesty of character by his willingness to talk unreservedly about even private affairs that apparently have little to do with the objects in hand. If a man's life is clean enough, it will be a book he won't hesitate to open freely.

Naturally I question an applicant for credit as to his former business relations and if he hasn't had business experience at all I sometimes go into such trivial matters as his relations with his grocer, butcher, milk man and other contacts of his family life. After testing a man in every way that I can through conversation with him, I check up what he has told me as well as I can on the outside and through his references.

One of the most straightforward young chaps I can remember came to me a few years ago to ask for a credit of between $7,000 and $10,000. He had $5,000 which he had saved from his wages as a mechanic in a tool shop, a very favorable indication, by the way. This fellow had never been in business and was frank to say he knew nothing about business, but every question I asked elicited an unhesitating and unevasive answer. Honesty, sincerity and determination blazed in his eye and to me he was very convincing. I never even troubled to verify this young man's statements on the outside. He showed me his bank book and his check book, indicating thriftiness and good living habits.

Domestic Habits a Guide

He told me of the success he had achieved in the shop where he was employed and of the many customers of that shop who had urged him to go into business for himself, promising to give him their business. This was his principal reason for believing he could make a machine shop business a success. It was my privilege to make it possible for him to make his start and he paid me back long ago and has since bought more than $30,000 worth of material from me. Today he pays cash and takes all the discounts.

I try to consider the human equation conscientiously. When trying to size up the moral and commercial qualifications of a man who has never been in business for himself before, the problem is difficult, to say the least. The methods I have mentioned will be helpful but here are two more tests I usually apply to complete the picture. For the man who has not yet been in business for himself, I try to determine whether he has or has not an instinctive talent for system and orderliness in the affairs of his everyday life. Does he carry life insurance and is he sold on the necessity of protecting the future of his family? If he carries life insurance, how does he make the payments, quarterly, semi-annually or annually? If the applicant manages to make all his life insurance payments annually in advance that is a good sign of his managerial ability, I feel.

The final test of the man's ability is to determine whether or not he holds on to money after he gets it. Unless it is humanly impossible, I want to know that a man has saved some money out of his earnings. I want to know how he has invested them, whether his investing sense is sound or flighty. There are other considerations naturally, such as the alertness of manner and ability to work cheerfully and helpfully with others, but those I have detailed are the ones that count most with me.

Machines and Tools for Cutting Disks from Plates of Optical Glass

By I. Wm. Chubb
European Editor, *American Machinist*

A simple operation in which diamond dust is used as the cutting medium—How the trepanning tools are made—Speed of cutting

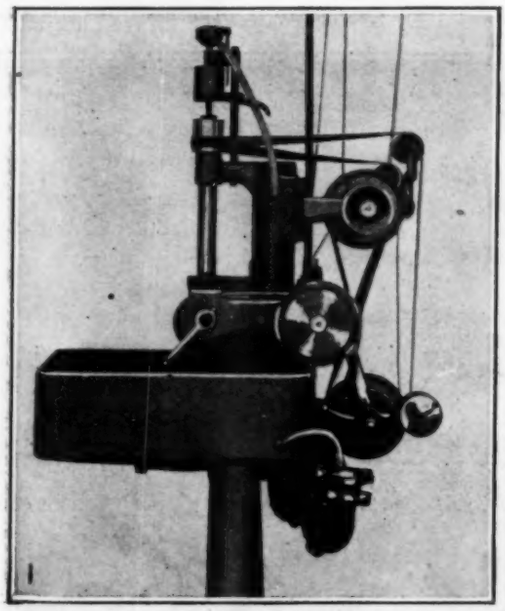
ONE section of the work of Taylor, Taylor & Hobson Ltd., Leicester, England, is the production of lenses for photographic and other purposes. As the result of their experience in trepanning glass to provide blanks for the lenses, they have designed and are now marketing machines for the trepanning of glass. The machines are available in two sizes, the smaller, Fig. 1, accommodating slabs or sheets up to 12 in. in diameter, and cutting holes at centers not more than 4½ in. from the edge, the spindle taking cutters from ⅜ in. to 5 in. in diameter.

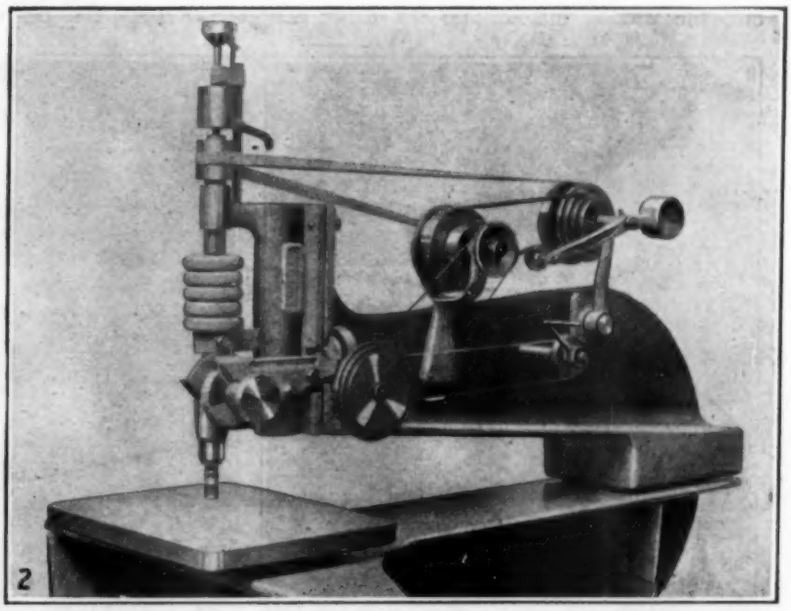
The larger machine, Fig. 2, will take slabs of any reasonable size and will cut holes at distances not more than 7 ft. from the edge, the maximum hole being 5 in. in diameter. The machines have vertical spindles rotating at velocities that give cutting speeds of about 700 ft. per min. The feeds available average ¼ in. per min. The spindle of each machine is hollow, coolant being poured or pumped through it and escaping by centrifugal action through a slit in the side of the tool. For the coolant, soluble oil, or any other lubricant that will not rust the machine, may be employed. The flood keeps the cutter cool and also acts as a chip remover, resulting in a good finish in the holes and on the disks.

The trepanning tool may be sent right through the thickness of the glass in one cut and, though this may leave a rather ragged edge where the cutter comes through, the finish is usually satisfactory when drilling holes, since in any case, they commonly have to be beveled. But, for cleaner cuts, the work may be done from each side of the plate in turn, leaving the hole with clean edges. To prevent the cutter from running through into the table, it is usual to place a sheet of brown paper under the glass and, of course, to set the stop on the machine.

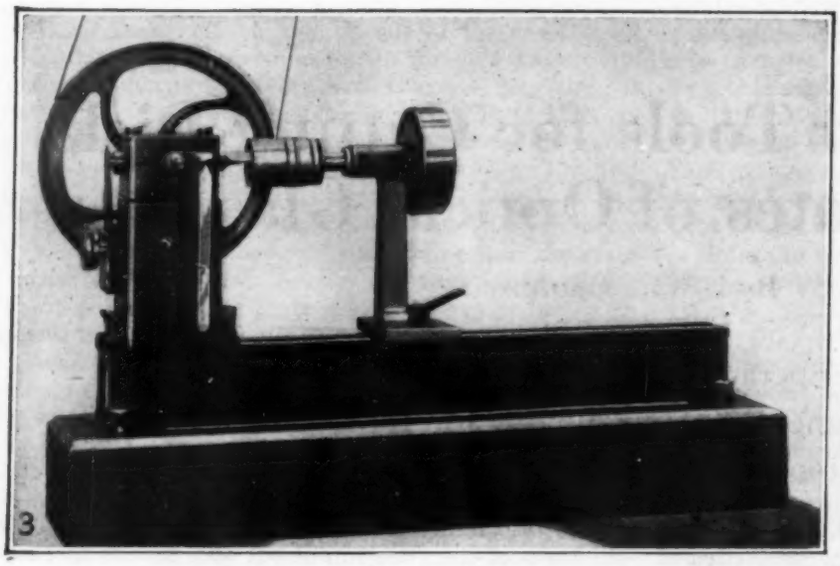
The trepanning tool is prepared in the following way. Lapidary plate, a soft iron ⅛ in. thick, is wrapped around one end of a hollow shank and is bound in position by wire, in a lathe. The edges of the iron do not meet by about one-tenth of the circumference. The tool is then set up in a notching machine, as in Fig. 3, where a chisel-shaped tool makes a series of serrations in the end. The notching tool is reciprocated by means of a cam and spring device, the cam withdraws it and a flat spring behind it drives it forward producing a notch at each stroke. The trepanning tool is indexed for the number of notches desired.

After the trepanning tool has been serrated all





Figs. 1 and 2—Machines for trepanning glass



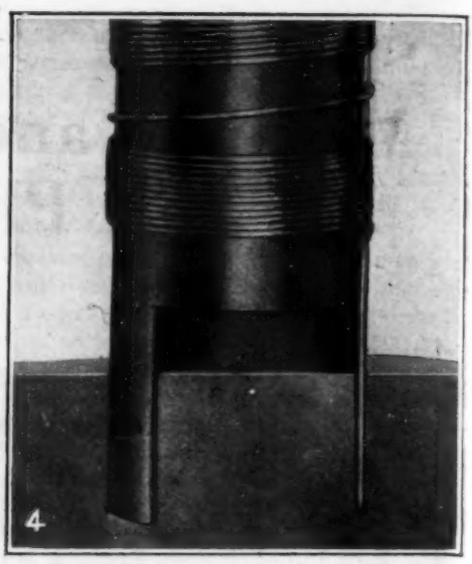
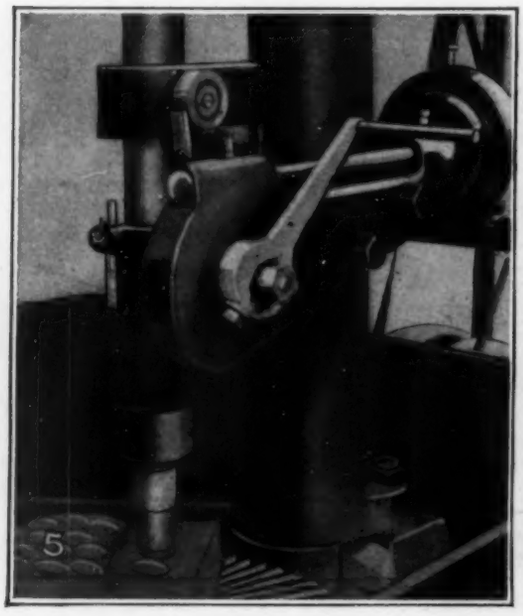


Fig. 3—Machine for notching the trepanning tool. Fig. 4—The trepanning tool

around the end, a mixture of diamond dust and grease is kneaded into the serrations by a small spatula. The trepanning tool is then placed in the chuck of a bench lathe, and a roller is pressed against the end, upsetting the tops of the teeth and pressing them on to the diamond dust. The roller also swells out the end of the tool sidewise so as to give cutting clearance. Fig. 4 gives a section through the cutter showing the wire binding on it.

The feed mechanism, Fig. 5, is an important feature of the machine. The feed is actuated by weights on the spindle, but the downward motion of the spindle is controlled by a driven cam. A slow feed with a safety device of this kind is essential for proper cutting. If the cutter does not penetrate synchronously with the movement of the cam, the fact indicates bluntness. The disks, when cut, have a tendency to remain inside the trepanning tool. While it would be possible to fit an ejecting device, it is usual in optical work to secure the glass sheet to the brown-paper backing by paraffin wax melted over a gas ring. When all the disks have been cut, the wax is melted and the disks are cleaned by washing them in soda solution. Weights amounting to 9 lb. are usual when drilling holes 5 in. in diameter.

The following figures relating to cost and production are available: In ¼-in. plate glass, 8 holes $\frac{7}{16}$ in. in diameter have been cut in 8 min. 32 sec.; 4 holes ¾ in. in diameter in 4 min. 43 sec.; and 2 holes 1½ in. in diameter in 3 min. 55 sec., the holes in these cases being cut right through. Cutting from both sides in the same material, 2 holes $\frac{7}{16}$ in. in diameter were made in 2 min. 22 sec.; 2 holes ¾ in. in diameter in 2 min. 34 sec.; and 2 holes 1½ in. in diameter in 3 min. 10 sec. Fig. 6 illustrates a slab of ¾ in. glass out of which 12 disks have been cut, each 1 in. in diameter, the time occupied from start to finish being 45 minutes. The 12 disks are shown spaced around the drilled slab. The tool will usually cut from 60 to 70 holes before needing recharging, and in ¼-in. glass, the cost of the diamond dust per circumference-inch of hole produced is ½d., the cost of the diamond dust being taken at 25s. per carat. The cost at other rates can, of course, easily be calculated. At present the market value is about 16s. per carat. The tool cost is practically negligible.



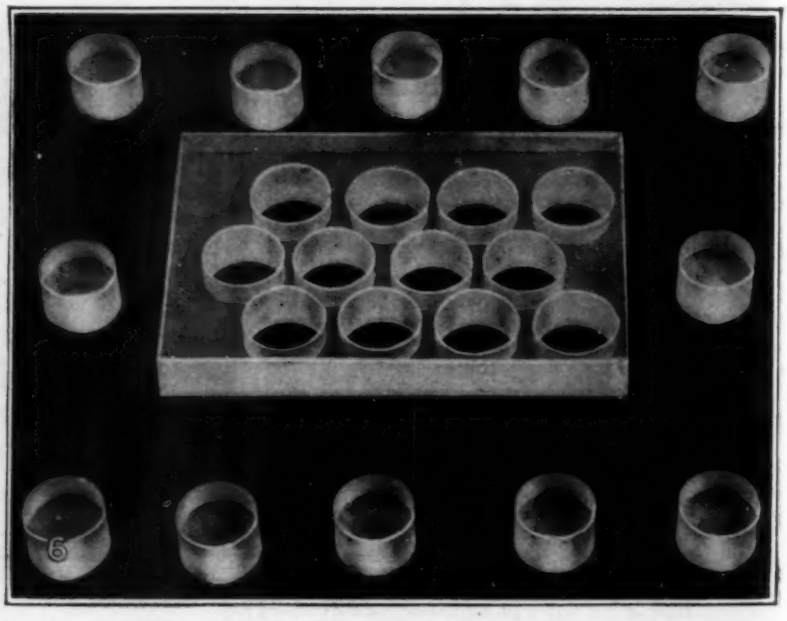


Fig. 5—Arrangement of the feeding mechanism. Fig. 6—Samples of trepanning

The Functions of the Design Division in a Technical Organization

By John F. Hardecker

Scope of each unit of this division—Scheduling of work and the progress of a job from its inception to the issuance of the final blueprints—Use of forms

THE DESIGN division as herein described includes all that part of the engineering department exclusive of the chief engineer and his assistant or the project engineers (if this system be used). The project engineers, as the representatives of the chief engineer and his assistant, are a part of the executive function of the engineering department and so are not included in the design division. This division as a whole is fundamentally concerned with the preparation of engineering data in such form as to make possible the efficient functioning of the engineering department as a service department of the factory.

The design division is composed of the following sections with duties as indicated:

The *analytical section* is primarily concerned with the preparation of stress analyses, capacity calculations, and all general mathematical, mechanical, or electric calculations used in design. This section serves as a source of detailed analytical information for the engineering department.

The *standards and specifications section* primarily develops standard parts and specifications on material, shop processes, and finishes. It serves as a source of standardization for the engineering department.

The *drafting section* utilizes the information prepared by the analytical section and the standards and specification section in the detailed design development according to the specifications of the project engineers. Hence this section is the engineering production unit.

The *checking section* checks the work of the abovementioned sections, and serves as the inspection unit of the engineering department.

The *blueprint and record section* reproduces in such quantities as required the work of the other sections and distributes the same to the various departments concerned. Furthermore this section keeps records of all design data.

The *chief draftsman*, as head of the design division, is responsible for the proper execution of the work performed by the division, for the personnel distribution, and for the maintenance of determined policies.

The *supervisors* of the various sections are responsible for all work done in the section with respect to its being correct, complete, clear, and finished within the scheduled time and date.

The *squad leaders*, who are assigned to major projects in the drafting section, are responsible (on their project) for the detailed design as to conformance with specifications, standards, and determined drafting practice.

Authority to perform work must be received in the design division on a prescribed form (project engineers' form) signed by the project engineer and forwarded to the chief draftsman via the assistant chief engineer. All changes on drawings that have been regularly issued can only be made in this manner, unless it is an obvious error of minor importance. Upon receipt of this written authorization, the chief draftsman forwards it to the schedule clerk, who records it in the follow-up folder

Sequel to "The Functions of a Project Engineer in a Technical Organization" by the same author published on page 641, Vol. 64, of the *American Machinist*.

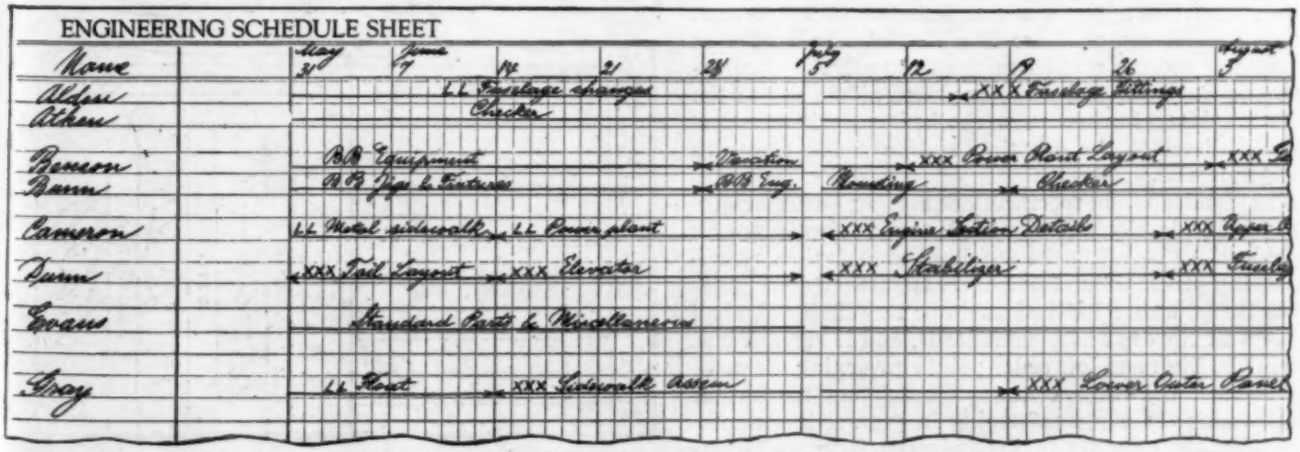


Fig. 1—Form for scheduling work according to personnel

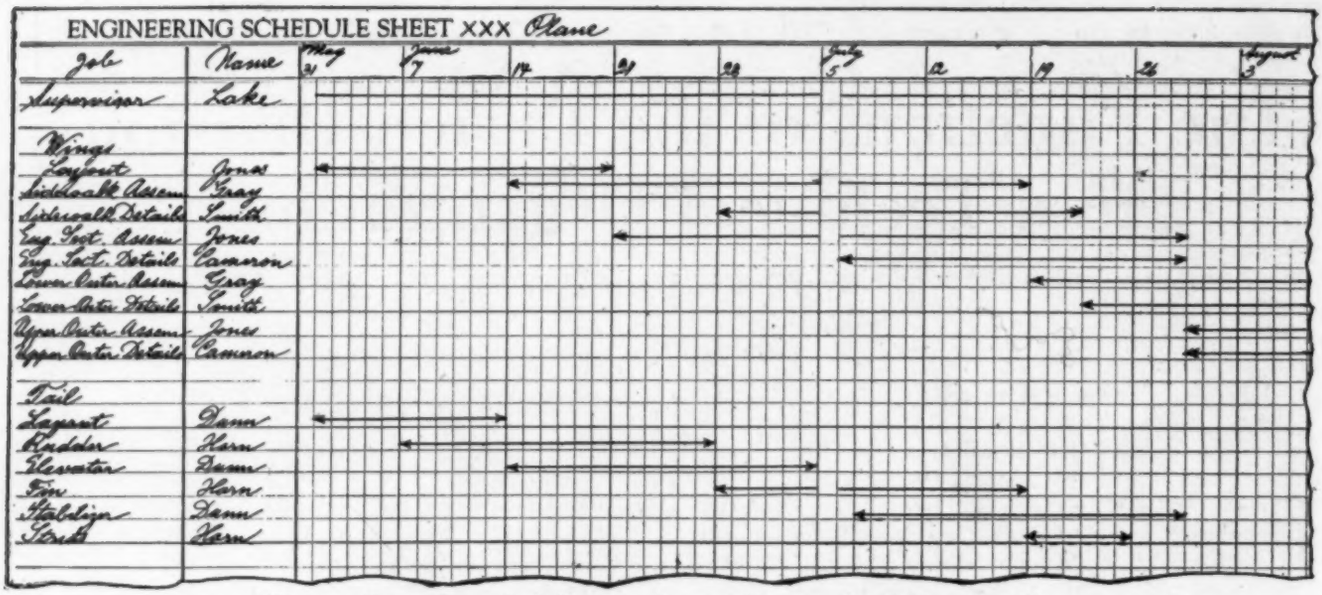


Fig. 2—Form for scheduling work according to the design details

of work to be done and turns it over to a particular section supervisor for action.

The *schedule clerk* maintains under the direction of the chief draftsman a complete schedule of all the personnel of the division, using the schedule form as indicated in Fig. 1. On major jobs, the clerk maintains, in addition, a complete schedule of the operations into which that job is divided and the personnel assigned to it, as shown in Fig. 2. These job schedules act as a source of information for scheduling the work in other departments of the organization.

When reports are prepared by the analytical section each report is assigned a serial number and the originals together with a title block are filed in the engineering files. Copies are bound in standard folders, with a blueprint of the title block pasted on the front of each folder. Reports are typed on transparent paper, carbon backed for blueprinting. Each report is made complete within itself; that is, sketches, drawings, sections, stress diagrams, etc., are bound in the report and assigned page numbers. The letter size sheet (8½x11 in.) is used as a standard, and if larger sheets are needed for tables or diagrams, the size is such that the sheet will fold into the binder.

The first page of a report is the title page with the title report number and date appearing at the top. Below the title appears a complete list of references. After the references there is a list of tabulated data giving the specific conditions for the analysis of calculations. Summation sheets are placed at the end of the report. After having been checked, reports are forwarded direct to the drafting section squad leader in charge of the project.

The standards and specifications section, beside originating and developing standard parts, also prepares specifications covering the purchase of materials, manufacturing processes and finishes. It further determines what items, either finished parts or raw material, shall be kept in stores as stock standards, and it recommends the initial high and low order points governing them.

Standard drawings contain a maximum amount of information thereon, conforming in general to commercial practices existing in the industry from which the parts are purchased. The drawings are complete within themselves, and make no reference to other drawings or parts. All work, after being checked, is issued direct to the section involved.

The drafting section prepares all drawings and bills of material, except those for standard parts. Preliminary raw material lists, as requested by the project engineer, are prepared also as an advance list of raw material for purposes of checking stores and ordering. The drawings are made in accordance with stress analyses, standards and specifications, and established drafting practice. Since a fundamental layout is the first requisite for drafting work, it is made on a good grade of drawing paper, and is accurately drawn to as large a scale as possible. This layout, being the backbone of the design, is clearly and properly labelled to permit ready reference throughout the life of the project.

The amount and nature of information required on

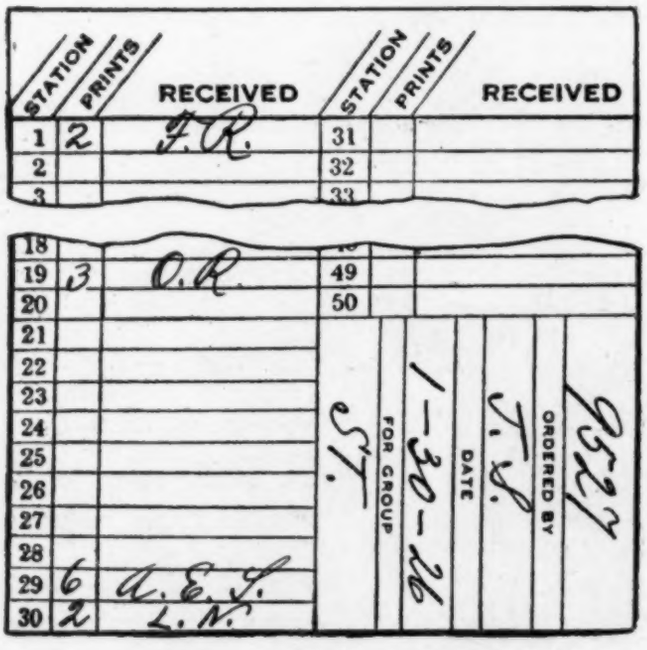


Fig. 3—Print order form

drawings will be dependent on whether it is to be a production job, an experimental job, or a shop planned job. This designation is made when the job is authorized.

Upon completing a given drawing, the draftsman prepares and delivers to the squad leader's desk a list of reference prints together with a check print of the completed drawing. The squad leader delivers the check print with the reference list attached to the chief checker, and gives him at the same time all verbal and written information concerning the job, so that drawings may be expeditiously checked.

All checker's corrections and changes are made by the draftsman who originally made the tracing, and both the draftsman and the checker agree to the corrections before the drawing is changed. After these changes have been made, the check print and tracing are again submitted to the checking section for signature. The tracing is then ready for approval and issue.

TITLE 1/2 H.P. Motor (Special) for L-25 Machine | DWG. No. 7321

SCHEDULE No. 7A98 | OPERATION No. 1 | DATE 1-7-26

Draftsman or Checker	Started	Stopped	Hours Worked	Description of Delay	Responsible	OK'd	Time	Cost	Remarks
Smith	1-7-26	1-8-26	16						drafting
do		1-9-26		absence	Smith				
do	1-11-26	1-13-26	24						drafting
do	1-14-26	1-14-26	6	changes on rotor	Hamilton	S.T.			drafting
do	1-15-26	1-16-26		working on 2 H.P. Motor	Chief Engineer	C			
do	1-18-26	1-19-26	16						
Jones	1-20-26	1-21-26	12						checking
Smith	1-21-26	1-21-26	3						corrections
Jones	1-21-26	1-21-26	1						recheck.
							88	17.60	

Fig. 4—The job card shows the distribution of work time

The checking section also checks all stress analyses for fundamental and detailed correctness, clearness, and conformance to general specifications, and all drawings for strength, fits, clearances, tolerances, and conformance with general specifications. Stress analyses and drawings are furnished the checking section in the form of check blueprints, together with a list of all references. Correct material is marked with a yellow pencil, incorrect with a red. Where a considerable correction is to be made, it may be drawn in pencil and encircled with a red line. All check prints are returned after checking to the squad leader concerned or to the analytical section supervisor as the case may be. Reference prints are returned to the engineering files and check prints are filed immediately after the work to which they refer has been signed by the checker and his chief.

The blueprint and record section reproduces and distributes the work of the design division as required, in the form of blueprints, Vandykes, and photostats, and it maintains files of tracings, blueprints and Vandykes. It maintains records on all local and foreign drawings, numerically, alphabetically, and in terms of projects, noting dates of issue and re-issue. It obtains receipts for all prints distributed and files all change notices. It serves as an engineering information bureau for the entire organization.

The supervisor of this section reviews and approves all drawing titles prior to their use, in order to maintain uniformity of nomenclature. Drawing numbers are furnished upon request for properly approved titles. Tracings, Vandykes, and change notices, all of which have been properly approved, are recorded on a numerical index card. All issues are also entered in a loose-leaf issue book as a record of that day's work. The issue clerk determines the distribution of copies in accordance with the instructions for each project listed in the order book.

A print order form, Fig. 3, is then made out and time-stamped. All originals are reproduced and distributed within 24 hours of the time they were received by the section. Rush orders receive immediate attention. The print order form also acts as a receipt, since the persons in the various stations about the factory initial opposite their station number upon the receipt of prints.

All division personnel, whose time is not charged to overhead, prepare daily time cards and charge their time to a given job order in a manner similar to that prevalent throughout the shops, giving in addition the operation and project names. The schedule clerk then checks off that day in the blank on the job schedule, Fig. 2, using red if it is checking time. An "a" indicates absence from work and a blank space means that the man has been detailed temporarily to another job. After these entries have been made the schedule clerk forwards the time cards to the accounting department.

REPORT of DELAY.

Date 1-28-26

To: Schedule Superintendent.

Via: Asst. Chief Engineer

Subject: Delay in work on Red Crescent Line Piers

Master Shop Schedule No. 719 Major Operation No. 3 J. O. No. X-719-093

1. Work on the above J. O. No. has been delayed for reasons as noted below.

Structural steel details delayed from Feb. 6 to Mar. 15 due to draftsmen being held over on Anchor Line job and not becoming available as scheduled.

(Signed) Evans

Fig. 5—Form for reporting delays

Job cards, Fig. 4, are prepared for each drawing or layout and follow the drawing through to issue. They bear the title and number of the drawing to which they refer. Their first function is as an instruction card for the draftsman, as the information in the designated spaces thereon is that obtained by the draftsman from his squad leader. Job cards give information relative to the time spent on drafting, checking, correcting after

NAME Agitator – Ore – 100 Ton | DRAWING | 0715
WHERE USED | DESCRIPTION | PART LIST | DATE 1-25-26

MODEL	ASSEMBLY
XB	0700

strengthened for extra heavy duty
Piping – 3 chg'd from 1" Heavy to 1" Extra Heavy
Piping – 7 chg'd from 1½" Heavy to 1½" Extra Heavy
Casting – 18 chg'd from C.I. to steel
Plate – 23 chg'd from 5/8" to 3/4" thickness
Beam – 29 chg'd from W.P. to Ash.
Green
checked White

RECOMMENDED DISPOSITION STOCK

B Improvement change – use up all parts on hand, in process, or on order.

REQUESTED Dale
AUTHORIZED T.E.H.
APPROVED J.L.E.
APPROVED

DRAWING AND PART LIST CHANGE NOTICE

Fig. 6—Form for reporting changes

checking, and re-checking. They also indicate the amount of lost time and its cause, such as absence of the draftsman, customers' changes, a project engineer's changes, and drafting errors.

As soon as the supervising draftsman and the squad leader are satisfied that the completion date (as scheduled) for the issue of of the drawings on a given project, or operation thereof, cannot be met, the supervising draftsman initiates a delay report, Fig. 5. The delay report quotes the original scheduled date as well as the new date established, and great care is taken to make certain that the new date established is one that can be met.

A change notice form, Fig. 6, is written for each drawing affected by a given change. A clear synopsis of the changes precedes the detailed information on the change notice. All parts and details affected must be specifically mentioned in stating the changes. To make the record complete on the change notice, where applicable, changes should read "Changed from - - - - - to - - - - -." The change notice bears the same date as the alteration column of the drawing to which it applies. The recommended disposition of stock must always be given, either in full or by means of a predetermined system of letter classification. The change notice is signed by the draftsman making the change and the checker and is clipped to the drawing.

Encouraging Thrift Among Employees

EMPLOYEES with a limited and often small income need to adopt the practice of budgeting to preserve themselves from the constant worry over where they are to raise the money to pay the next bill. The Ellwood Works of the National Tube Co., Ellwood City, Pa., prepared a budget of which one of the pages is shown in the accompanying illustration, to promote the budgeting habit and has been selling them at cost to its workers.

The cover of the budget book bears the slogan, "Budgeting is telling your dollars where to go instead of wondering where they have gone." Each page is devoted to the income expenditures and savings over a period of one month and to an estimate of the expenses for the following month. On the back of each page are suggestions for manipulating the income in the most efficient way so that savings can be set aside.

An analogy has been made in the budget book, wherein the rules of the "money game" are compared to those of any other. The budget book is designed for keeping score. Like any other game, this one has two main factors in the attack and the defense. The strength of the attack is shown by the amount that can be entered in the "Income" columns of the book while the power of the defense is measured by the amount that can be carried over into the "Savings" columns. A thorough knowledge of the methods of the defense always precedes the ability to make a really strong attack.

Advice on investments, insurance, real estate and building and loans, the use of the installment plan as well as reasons for "Owning your own home" are given.

MONTH OF ---------- 192---- DAY	INCOME			EXPENDITURES																		SAVINGS					
	SALARY OR WAGES	OTHER INCOME	TOTAL INCOME	FOOD	RENT, HEAT WATER & LIGHT	CLOTHING & LAUNDRY	HOUSEHOLD SUPPLIES & FURNITURE	TAXES & INTEREST	HEALTH: DOCTORS DENTISTS, MEDICINE	EDUCATION BOOKS & PAPERS	DUES TO CLUBS & FRATERNAL ORGANIZ.	CHURCH & CHARITY	AUTOMOBILE EXPENSE	VACATIONS & AMUSEMENTS	REPAIRS, IMPROVEMENTS & INSURANCE ON PROPERTY	TOBACCO & INCIDENTALS		TOTAL EXPENDITURES	LIFE INSURANCE	PAYMENTS ON REAL ESTATE	PAYMENTS ON STOCK	OTHER SAVINGS	TOTAL SAVINGS	WITHDRAWALS FROM SAVINGS & LOANS	DAY
1																										1
2																										2
3																										3
4																										4
5																										5
29																										29
30																										30
31																										31
TOTAL																										TOTAL
ESTIMATE FOR NEXT MONTH																										

Sample page of the budget book

Automotive Production

High Production Machines in the Automobile Shop

The Cincinnati Vertical Automatic

A continuous production machine for the rapid turning, drilling and facing of chucked parts

IT IS now widely recognized that production jobs calling for duplicate turning, drilling, and facing, which would ordinarily be done in a lathe or turret machine, can be handled economically on a continuous production machine if the quantities of the articles warrant the higher first cost of machine and the expense of increased tooling time. Jobs of this class occur in quantity and variety in the automobile shops, and an automatic machine of this nature which has already found a place in the automotive plant is the vertical automatic shown in Fig. 1, and built by the Cincinnati Engineering Tool Company.

The vertical automatic is a six-spindle machine with one loading and unloading station and five progressive working positions. It is applicable to the complete machining of any piece that can be handled in five operations from one side, and which will require not more than 3½ in. of vertical travel. Such parts as valve stems, faucet bodies and stuffing boxes are being done on the machine. In Fig. 2 is shown a variety of articles that have been handled on a production basis by the vertical automatic.

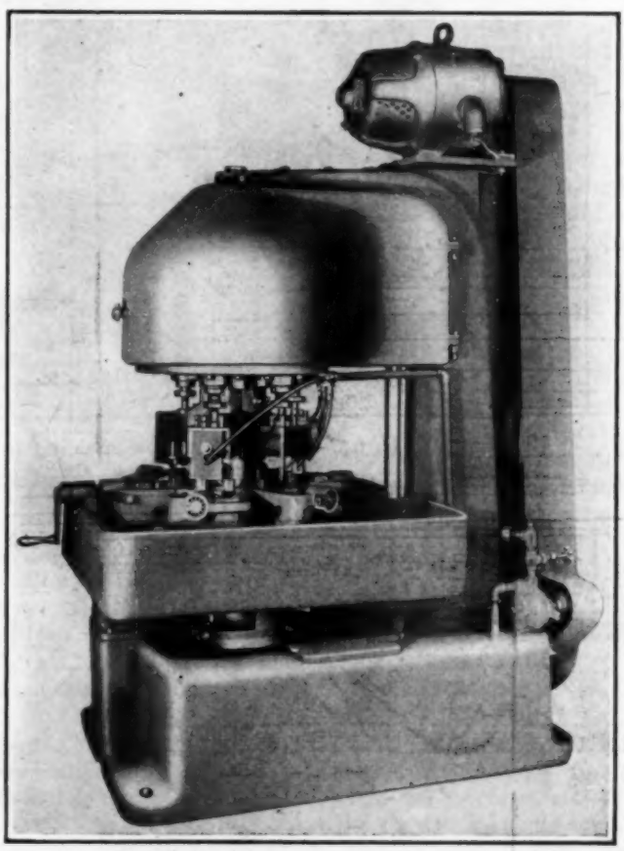


Fig. 1—Cincinnati vertical automatic

The machine has two turrets in the lower assembly, one carrying the chucks and the other carrying the feed cams. The upper, or work turret, is fitted with sleeves through which project the stems on each chuck table, and which guide the vertical feed movement. The lower turret is fitted with detachable cams especially designed for each operation on a given piece of work. These cams rotate in a clockwise direction to feed the work up, and draw it back again.

For indexing, the work and feed turrets are automatically locked together and rotated in a counterclockwise direction. When the chuck is centered under the spindle the work turret is released from the other turret and held in position while the feed turret reverses for the feed and withdrawal. At the end of the stroke the two again lock together, the work turret is released from its position, and the indexing is repeated.

The spindles are independently geared so that each can be run at its most economical speed without reference to the others. The spindles are also separately adjustable for height. The motor drives the spindles independently of the work and feed turrets. The latter are thrown

Automotive Production

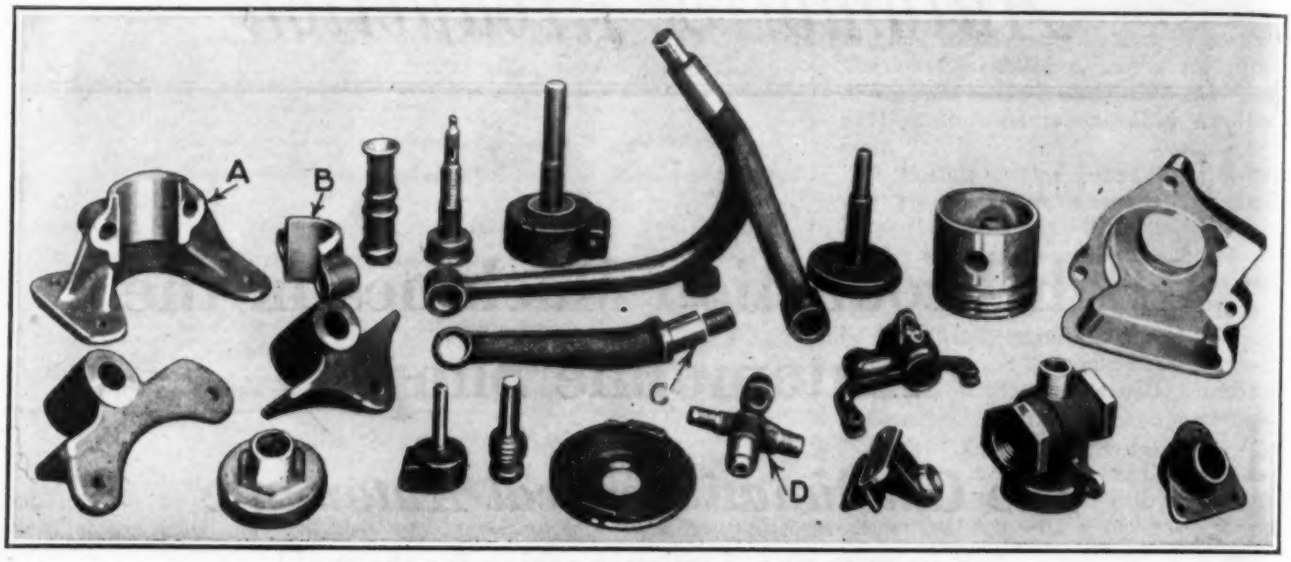


Fig. 2—Typical parts machined on the vertical automatic

into motion by means of a friction clutch operated by a foot treadle in the base of the machine.

The Chevrolet steering gear bracket and the cap shown at *A* and *B*, Fig. 2, was handled as a production job on the vertical automatic at the rate of 6 pieces per minute. The parts are malleable iron with cored hole. In Fig. 3 is shown a front view of the tool set-up showing the piece in the loading position, and the tools for the first and last operations. In Fig. 4 the complete layout of operations is shown.

Another automobile part machined successfully on the vertical automatic is the steering arm shown at *C*, Fig. 2. The turning of the thread end and taper on the

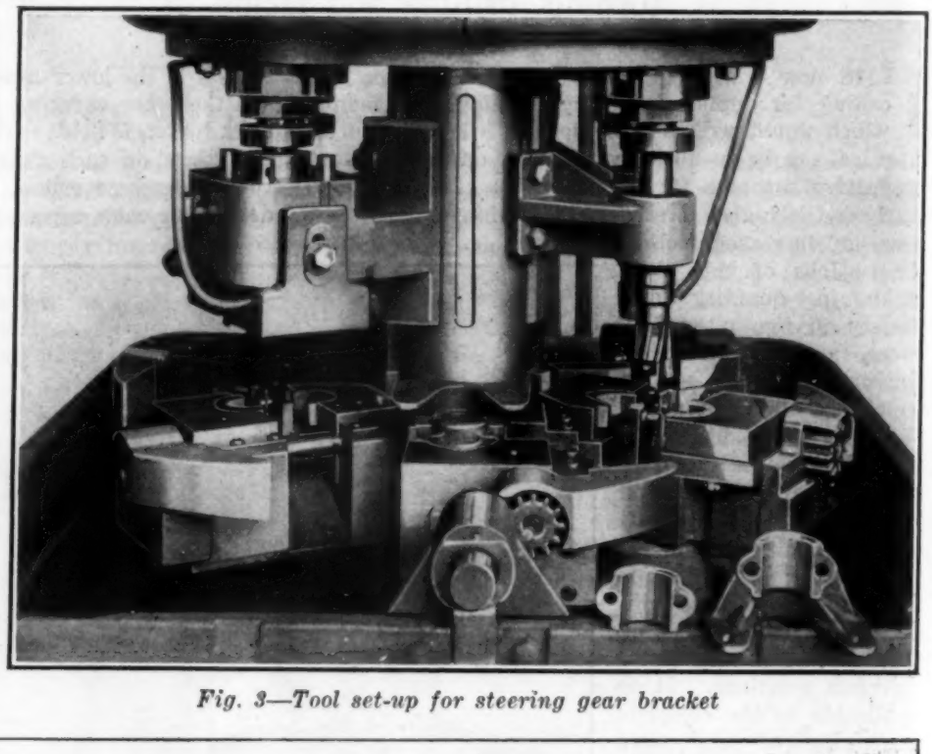


Fig. 3—Tool set-up for steering gear bracket

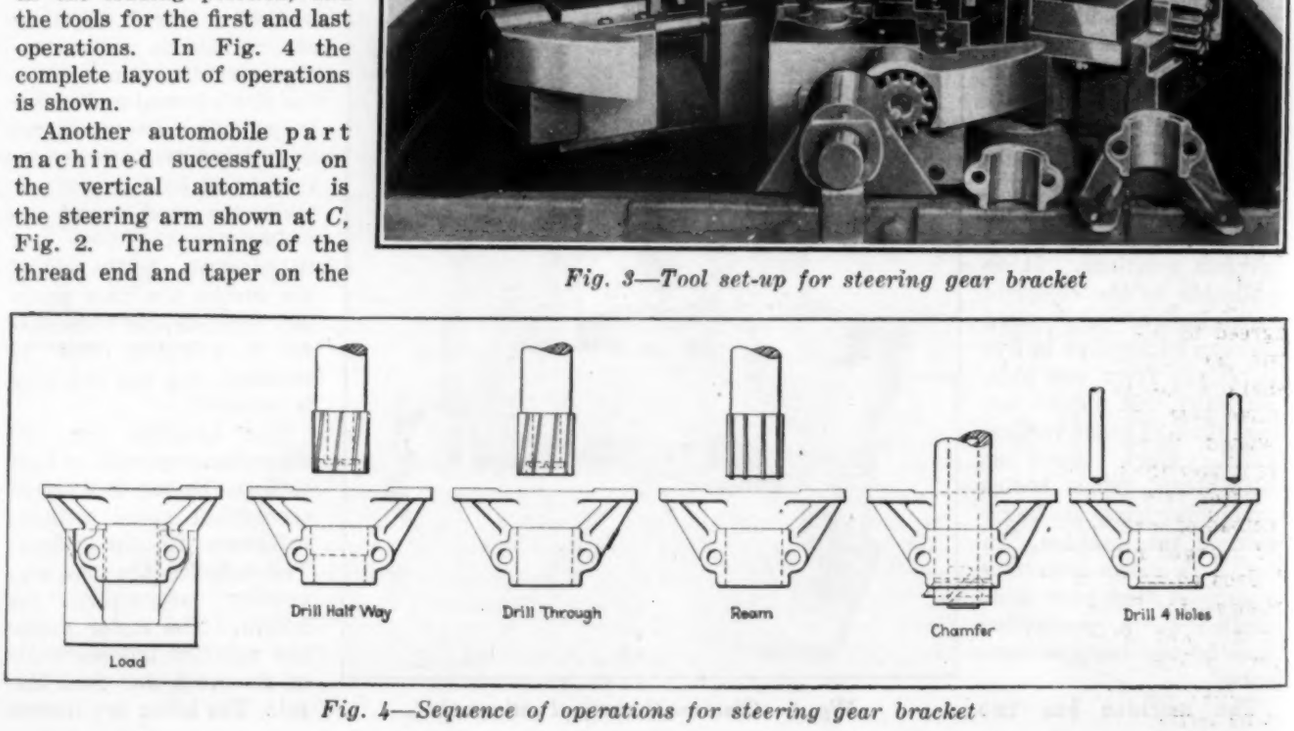


Fig. 4—Sequence of operations for steering gear bracket

Pontiac arm was accomplished at the rate of 110 to 114 pieces per hour using only four working spindles. The thread on this steering arm is 1 in. long, and the taper 1¼ in. long. The maximum diameter of the taper is approximately ⅛ in. Prior to the installation of the automatic the piece was turned on a lathe, and the new method is actually replacing three lathes. If all spindles were used and the production speeded up to normal capacity for the machine, it is claimed that 180 finished pieces per hour could be obtained, which is equivalent to the maximum production from six lathes.

An interesting part produced on the Cincinnati vertical automatic is the Chrysler hydraulic tee shown at *D*, Fig. 2. The five operations performed on the threaded ends of this drop forged part consist in turning the outside diameter, drilling, chamfering, burnishing and threading. The turned and chamfered seat at the front of the thread must be accurate and concentric with the thread. The rate of production attained on this piece is 4 per min. for machining each end.

The construction of the machine is designed to meet the most severe service. All main shafts and spindles are of high-carbon alloy steel, and are mounted on radial and thrust bearings. The driving gears are also of the same material. The friction clutch is operated by a foot treadle or by hand, and a brake is provided for quick stopping of the machine.

The vertical automatic weighs 6,750 lb., and takes up a floor space in working position of 40 in. wide by 49 in. deep. The height of the machine is 80 in. The flood lubrication of the machine mechanisms, and the flow of cutting lubricant are handled by pumps provided in the machine, and the machine is otherwise completely self contained.

How I Gave a Discount

BY CHESTER H. FRANKLIN

This discount business has some funny angles. Some customers don't care much what the list price is but if they can get a discount they are happy. I had a case a few years ago when the buyer for a big concern came in, looked over one of our machines, liked it, and said he'd leave an order—if I'd give two per cent discount for cash.

Now we had never played the discount game before, but here was a good customer, and we sure wanted that order. So I said O. K., we'd make an exception in their case and do it. The "exception" business always pleases them. So we went into the office to fix up the order.

There were several extras, which was the reason I agreed to the discount. And I aimed to make up the two per cent on the extras. But not being much of a shark on mental arithmetic and having him sitting the other side of the desk watching me, I got sort of twisted, though I didn't let on to him. Anyhow he went over the figures, looked wise and signed the order.

After he'd gone, I figured it all over and found that instead of making up the two per cent as I'd intended—I'd charged him six per cent over the list price! Then I debated as to whether I'd send him back the extra money—for I only intended to make up the discount—or if it was safer to keep still and take a chance on his getting wise later.

I kept the money. And he's since reordered on the same terms. So I guess Barnum was right!

Curbing Ambition

BY ENTROPY

"SAY!" burst out Jim, "you know that young fellow that has been sitting on a high stool in my office for the last year? Well he is all pepped up right now. He went off last week to go back and see his 'alma mater.' I made him spell it for me because I didn't just get it the first time. Well, it seems that all the graduates of his college become general managers, or consulting engineers, or something of the kind soon after they get out of school. He is working his head off today trying to impress me with the idea that I had better retire and let him run the business. I hate to tell him where he gets off. It isn't his fault that he is exaggerating his chances. It's the fool enthusiasm of a lot of professors who never tried to buck their way up through practical business."

Jim knows that I have a college degree stored away somewhere. Part of his story was aimed at my goat, but I was perfectly willing to let that animal out for a few minutes. Really Jim is a mighty fine chap and he ought not to be disappointed every time he comes over, but I started in to read him a lecture to the following effect:

"You lay off that boy of yours. He probably hasn't the slightest thought of aspiring beyond his ability; he is ambitious, and you wouldn't want him if he was not. What effects you is that he wants to go ahead faster than you did. You forget that times have changed, and you don't know what the rest of us are saying about your old shop behind your back. You need the boy, and if you handle him right he may make a sizable bunch of money for you. You need new blood. The boy has a lot of ideas that both you and he will discard, but there will be a lot left that will be profitable. What you ought to do with him is to encourage the outflow of ideas, but cull them over. He is bright enough to see your point if you give him reasons why they won't work.

"Another thing, Jim, that boy won't stay with you unless he sees something ahead. You are just as much on trial in his mind as he is in yours. He wants to get with some progressive firm that has a future for him. If he sizes you up as a 'dead one,' and if he thinks your competitors are going to put the skids under you, he and every other capable young chap will get out. It is a pretty safe bet that a shop that can't keep some engineering and college graduates is probably due to slide down hill.

"These young college men know that they can probably find other jobs more easily than the non-graduates, therefore, it is the college men who put up with the least amount of discouragement, and who are keenest to know whether they are headed up hill or down. They may be lacking in knowledge of some details that are second nature to you, but, believe me, they know at least as much about human nature as we do."

The machining of piston ring grooves is always a problem. Finishing with a hardened steel roll to burnish the sides and eliminate tool marks is a common method. Others claim better results with two cutting tools, one to rough and the other to finish. The finishing cut is small and with slow feed. Unless the sides of grooves are smooth they wear too rapidly and cause ring slap and leakage.

Johnson Bawls Out a Price Cutter

By John R. Godfrey

"HAVEN'T any of you machine builders any backbone?" 'Twas "Old Man Johnson" interviewing, or being interviewed by, a machinery man the other day when I dropped in, and as usual he handed out a few chunks of wisdom which will probably not be heeded. In fact, the machinery man was the head of his concern who had come to clinch an order.

"Why, er—just what do you mean, Mr. Johnson?" was the weak comeback.

"Don't you understand English, Mr. Jones, or is your hearing bad? You and your men come to me with tales of woe about prices being too low—haven't made any money since the war—how we wicked manufacturers don't appreciate what you do for us—and a lot of other bunk. You've told it so often and so well that I almost got to believing it myself. But I know its pure bunk now or you fellows would have quit business long ago. When I find my prices are too low I raise 'em—and prove to the customer that the new price is fair. If your prices are really low, you'd do the same."

"But, Mr. Johnson, you don't understand our conditions. The competition is fierce, and some of them don't stick to prices. We couldn't get orders at higher prices. You want to buy as low as you can, don't you?" said Jones.

"Yes, Jones—but you're a weak-kneed business man to let me get them too cheap. You don't have any more competition than we do. But you don't seem to have the same 'stick-togetherness' that we have. If we can't make a profit, we don't want the order. It's the fellows who take orders too low who go out of business.

"And I don't quite see where you get off accusing others of cutting prices after you just offered to shade your list if I'd give you the order now. I've met a lot of birds like you before. Your man has been here several times and did a good job of selling—only you don't make as good a machine as I want to buy. You wanted to show him you're a real go-getter so you came out yourself—and I don't bite at the first bait you offer me—a discount that you wouldn't let your man make. Every buyer knows that he can get better terms from the main guy himself than he can from a salesman. That's why they ask for the boss. And you feel flattered and think it's because they want to deal with the 'big man.' They do, because they know you big men are the easiest marks. You don't dare go home without the order for fear the office boy would chuckle. But he does, anyhow, because he darn soon hears how you shave prices to get orders—when you do."

"I didn't come here to be insulted, Mr. Johnson."

"Sure you didn't. You came here to insult my intelligence with a cock-and-bull story about prices being too low—and then offering to make 'em lower. If you are going to lose money, why do you want my orders? If your prices are too low—and I admit they may be—why don't you raise 'em—and why do you cut 'em to me? Sounds mighty fishy, Mr. Jones."

"But you see, Mr. Johnson, we're a small concern and we've got to keep going."

"And you're likely to stay small, Jones, if you don't go bust. It's a wonder you don't study your own industry to see which concerns succeed—and why. You tell me few of them make any real money! How can they if you are a fair example? Low prices, and you cut those if anyone gives you half a chance, and then complain of low profits.

"Just look at the best concerns in your line and watch 'em close. Do they cut prices? You know darned well they don't. And you know if one of their agents offers an extra arbor or faceplate as a chromo, he's hunting a new agency the next day.

"They make money because they build good machines, sell them at a fair price and stick to it. And they have the respect of the buyer. This price cutting don't get you anywhere. I might save a few dollars if I bought your machine. But I'd be putting a crimp in the industry that helps me make a profit—and in the long run it wouldn't pay.

"You people talk about practicing business ethics and swear to stick to list prices—and you don't do either. You're in the same class with the clothing dealer of 50 years ago. He always asked you twice as much as he expected you to pay and you haggled over prices until he got down to a fair price—perhaps. The clothing trade abandoned that practice 40 years ago. And I don't just see how men of your calibre tolerate and practice it."

"We'd like to stick to prices, Mr. Johnson, but what are you going to do when the other fellow don't?"

"The best concerns—and this isn't the same as the biggest in all cases—stick to price lists even if they lose an order. They also make money in the bargain. You can stop price cutting to-morrow if you really want to."

"How, Mr. Johnson? I'd sure like to know."

"Have every member of your association furnish price lists to every member who asks—and to the secretary. Publish the price at which every order is taken. If it's at list price, there is nothing to be ashamed of. If it is below list, have a fine equal to the discount paid into the association for research work.

"If your machines aren't good enough or if your shop facilities won't let you make them at a fair price—better try making shoe horns or egg beaters. Don't clog up an industry when you can't help it or yourself either.

"Nobody realizes how much we need good machinery more fully than I do. We need better and better machines every year. And only the shops that make real money can give them to us. That's why I'm willing to pay more than your cut price for the other machine. I believe it's better than yours. I know that if they make money their next machines will be better yet. And I want 'em better every year. When you build a better machine, charge a fair price for it, and have the guts to stick to your price, come and see me."

Maxim Silencer Applied to Oil Engine Exhaust

After many months of experiment, the Ingersoll-Rand Co. succeeded in adapting the Maxim Silencer to the exhaust of its oil-electric locomotive. Unlike the muffler of the automobile, the exhaust gases pass through the silencing unit without resistance by reversal or by any obstruction. Instead the exhaust is forced to reflect many times in the silencing unit, which has been so proportioned by mathematical analysis that the energy of the sound wave is absorbed before it reaches the outlet. It is claimed that the noise of the exhaust can be heard only faintly when one stands within a dozen feet of the locomotive.

Graphical Analysis of Circular-Arc Cams

By G. L. Guillet
Associate Professor of Mechanical Engineering
Pennsylvania State College

By means of the graphical method of analysis, based upon equivalent link mechanisms, velocity and acceleration curves can be produced directly—Klein's construction

TEXT books dealing with cam design generally devote considerable attention to the method of drawing cam profiles that will produce follower motions having definite characteristics. Motion with constant velocity or with constant acceleration, or simple harmonic motion most frequently fill the requirements of practical applications; consequently the necessary constructions for the requisite cam surfaces are taken up in detail for such cases. The resulting cam outlines are seldom composed of curves of simple form, and hence they can usually be specified on the drawings only by giving radii at various points on the outline at certain angular intervals. The specification, laying out, fabrication, and inspection all become difficult, particularly where close limits are necessary. Therefore, many cams in practical use have profiles composed of circular arcs and straight lines, the two forms most easily and accurately dealt with from the standpoint of production. Such cams when used in combination with ordinary followers, do not give either constant velocity or constant acceleration over any section formed by a single arc or straight line. The centers of curvature and radii may, however, be selected to approximate many desired motions and their deviation from constant velocity or constant acceleration conditions, is often an advantage than otherwise, especially when springs are employed to insure continuous contact with the follower.

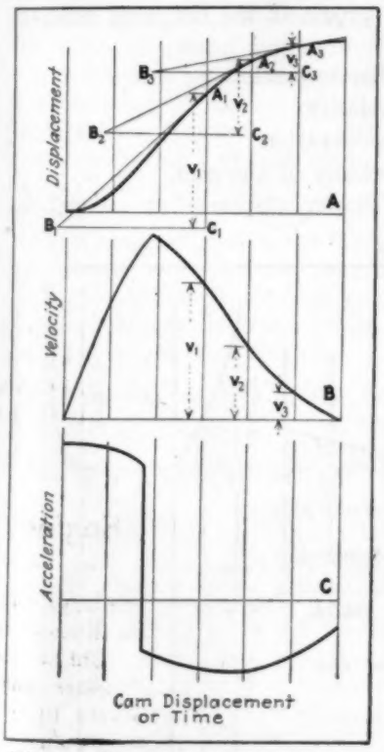


Fig. 1—Usual method for obtaining velocity and acceleration curves from displacement diagram

That the advantages just mentioned are of major importance is shown by the general use of such cams in one of the largest fields in which cam mechanisms are employed, namely, for the operation of valves on the high-speed internal-combustion motor. In this application the requirements are exacting; poor design, or lack of accuracy in construction, is fatal to both durability and quietness of operation. Furthermore, small variations in cams that perform the same function on different cylinders of the same engine may result in loss of power and irregular running.

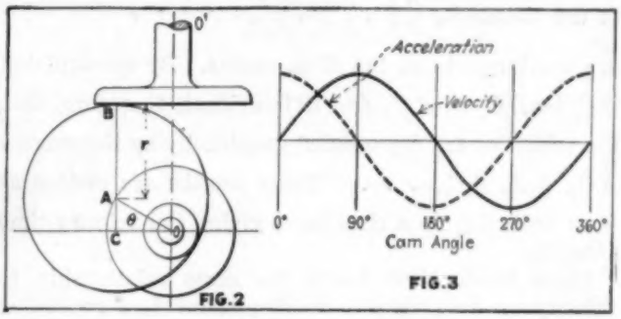


Fig. 2—Simple form of cam. Fig. 3—Corresponding velocity and acceleration curves

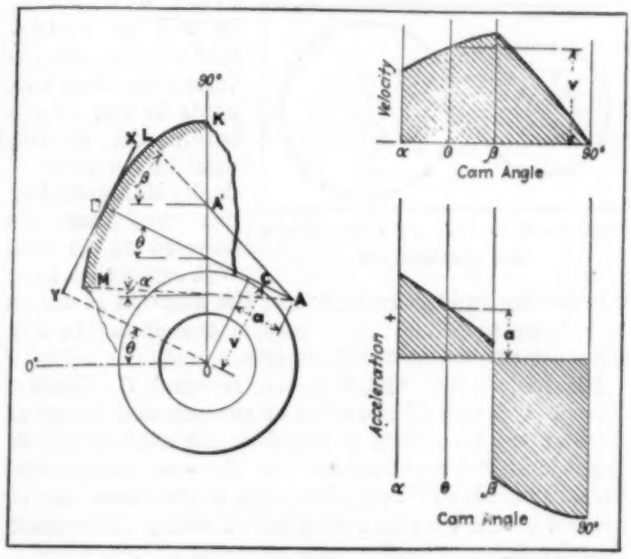


Fig. 4—Characteristics of a cam outline composed of two circular arcs

Where a cam is used at a high speed of rotation, the acceleration and deceleration of the follower is a vital factor, since the pressure between the cam and follower, the stresses set up in the mechanism, and the necessary

The first of two articles. The second will appear in an early issue.

spring pressure are mainly influenced by the form of the acceleration curve.

The method of obtaining, graphically, velocity and acceleration curves, as given by some writers on the subject, is a general one that can be applied to any form of cam profile. In brief it involves the following procedure. In Fig. 1 the results are shown.

Follower displacements are plotted on a base representing the angular displacement of the cam. If the cam turns at constant speed, which is usually the case, the base represents time as well. The drawing is then a displacement-time diagram.

The velocity of the follower at any instant is proportional to the angle of slope of the displacement curve. Taking a series of points A_1, A_2, A_3 . . . , on the curve, construct triangles $A_1B_1C_1$, $A_2B_2C_2$, $A_3B_2C_3$, etc., in which the AB lines are tangents to the curve and the horizontal BC lines are all of equal length.

The velocities at A_1, A_2, A_3, . . . are proportional to the quantities $\frac{A_1C_1}{B_1C_1}$, $\frac{A_2C_2}{B_2C_2}$, $\frac{A_3C_2}{B_3C_2}$, . . . , since these are the tangents of the slope angles. By construction $B_1C_1 = B_2C_2 = B_3C_3$, and it is evident, therefore, that the velocities are represented graphically by the lengths A_1C_1, A_2C_2, A_3C_3, . . . These lengths are plotted at B as ordinates on a time base, giving the velocity-time diagram.

Since acceleration bears the same relationship to velocity as does velocity to displacement, a repetition of the construction just outlined, if applied to the velocity curve, enables us to draw at C an acceleration-time diagram. It will be noted that this process involves drawing tangents to two curves before the desired acceleration curve is finally obtained. Any one who has attempted to do this will agree that such a procedure is inaccurate, unless the diagram is drawn to a large scale and great care is exercised. In any case, the process is a tedious one.

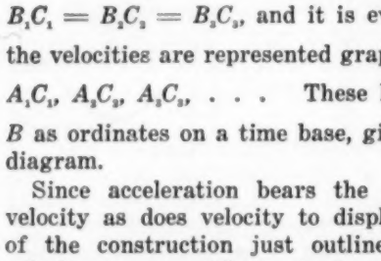


Fig. 5—Principle of equivalent-link mechanism

Ricardo, in his "High Speed Internal Combustion Engines," developed a method of analysis and design of circular arc cams that is based on the substitution of equivalent link mechanisms for the cam mechanism. This same idea of equivalent link mechanisms can be applied to the graphical solution of nearly all common cam forms.

Compared with the analytical method, the graphical method has the advantage of producing curves directly, and these are always more enlightening than tabulations of figures. A comparison of the graphical constructions that follow with the general graphical method outlined above will show that the former are more accurate and much less laborious. Moreover, the link mechanism analogy itself is of assistance in design, as the possibilities and limitations of this type of cam profile are more readily seen.

In Fig. 2 is shown a simple cam that consists of a

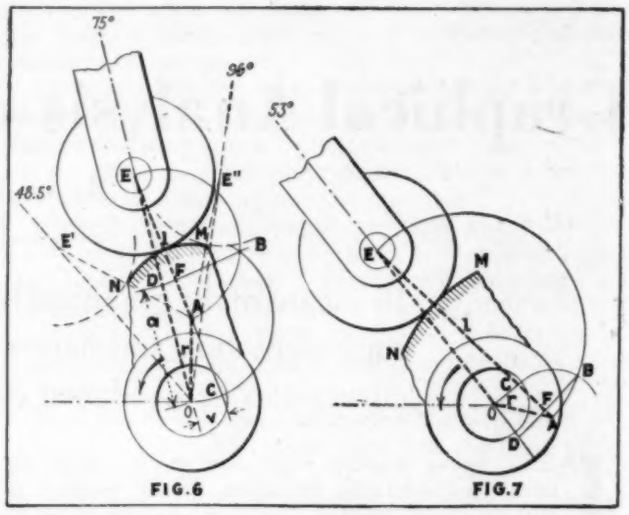
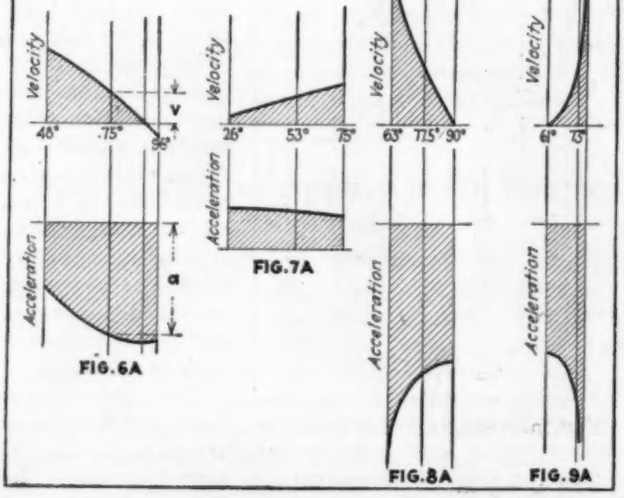


Fig. 6—Klein's construction applied to cam with roller follower, r less than l. Fig. 7—Case where l equals 3.5 r

circular disk rotating about some point O, other than its geometric center A. The follower is of the flat-faced or slipper type and is guided so as to move with rectilinear displacement along the line OO'. The distance R from the center A to the face of the follower is evidently constant for any position of the mechanism. Therefore, the vertical motion of the point A and the follower are the same at any instant, and when the cam rotates with constant angular velocity, the follower has harmonic motion. It will be observed that B, the point of contact, is always at the foot of a perpendicular from A on the follower face. If a perpendicular OC is drawn from O to AB produced, the following analysis can be made:

Let s = follower displacement
v = follower velocity
a = follower acceleration
ω = angular velocity of the cam.

In the figure, the follower displacement = AC = $OA \sin \theta = s$.



Figs. 6A, 7A, 8A, and 9A—Velocity and acceleration curves corresponding to cams shown in Figs. 6, 7, 8, and 9 respectively

The follower velocity $= \frac{ds}{dt} = \frac{d(OA \sin \theta)}{dt} = \omega \times OA \cos \theta = \omega \times OC.$

The follower acceleration $= \frac{dv}{dt} = \frac{d(\omega \times OA \cos \theta)}{dt} = -\omega^2 \times OA \sin \theta. = -\omega^2 \times AC$

By plotting the lengths OC and AC as ordinates on a base representing cam angles, we can determine points on the velocity and the acceleration curves for the follower motion. These curves, shown in Fig. 3, are evidently sine and cosine curves. The same construction applies to a cam, the profile of which is composed of several circular arcs of different radii: the follower motion will correspond to sections of harmonics, varying in phase and amplitude in accordance with the locations of the centers of curvature. Fig. 4 illustrates the application to a portion of a cam outline formed by two circular arcs, KL with center A' and LM with center A. When the graphical construction is performed in this case, as well as in those that follow, the cam is regarded as the stationary member in the mechanism, and the follower is moved about it. This conception is permissible, since it involves no change in the relative motion of the follower and the cam. When the follower has moved through any angle θ from a reference position (in this case a horizontal line), the follower face lies along XY and touches the cam at the point B, at the foot of the perpendicular AB. From the above discussion it is evident that OC $(= v)$ and AC $(= a)$ represent graphically the velocity and acceleration of the follower at cam displacement θ. These distances, therefore, are transferred to the velocity and acceleration diagrams as ordinates. Other points on the curves are obtained in a similar manner. The follower contact with arc ML begins at angle α and terminates at angle β, when the cam is assumed to have counterclockwise rotation. In this event, the acceleration represented by AC is positive and has consequently been plotted above the base line. If C should fall on AB produced, the acceleration would be negative.

The method of calculating the scales for velocity and acceleration can best be illustrated by a numerical example. Assuming that the cam turns at 900 r.p.m. and that the cam is drawn twice full size, we can find the required scales as follows.

The angular velocity of the cam $= \omega = \frac{2\pi \times 900}{60}$ = 94.2 radians per sec.

The follower velocity

$= \omega \times CO$, where CO is full size

$= \omega \times \frac{CO}{2}$, where CO is twice full size

$= \frac{94.2}{2} \times CO$ in. per sec., where CO is measured in inches

$= \frac{94.2}{12 \times 2} \times CO = 3.92 \times CO$ ft. per sec.

For the velocity curve, therefore

1 in. = 3.92 ft. per sec.

Similarly for the acceleration curve

$$1 \text{ in.} = \frac{\omega^2}{2 \times 12} = 369 \text{ ft. per sec. per sec.}$$

A roller follower is said to be "offset" when its center moves in a straight line that does not pass through the cam axis. The amount of offset is measured by the shortest distance from this line to the axis of the cam.

The following list includes all ordinary forms of roller-follower cam mechanisms:

1—Follower has rectilinear motion, and offset is zero. The roller center, therefore, moves in a straight line passing through the cam axis.

2—Same as (1) but roller is offset.

3—Follower is pivoted and, therefore, has angular motion about a fixed pivot point.

In the case of a roller follower having rectilinear motion and no offset, the principle of equivalent link mechanisms, already mentioned, is used to obtain a

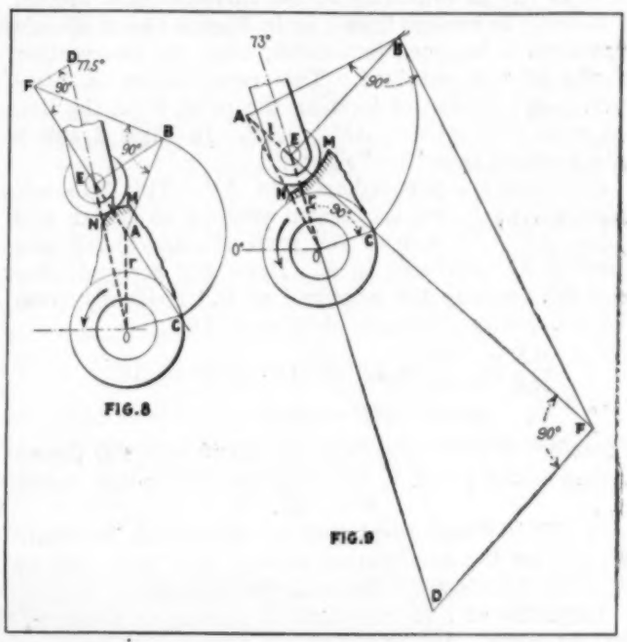


Fig. 8—Construction where 1 equals 0.8 r. Fig. 9—Modification in construction due to concave cam surface

graphical solution. Fig. 5 shows a cam mechanism of this type. In dotted lines the equivalent link mechanism is indicated. The latter is an ordinary direct-acting engine mechanism, or slider-crank chain, in which the crank length is r, and the connecting rod length is l. The velocity and acceleration of the piston in this equivalent mechanism is the same as the velocity of the follower. We apply this analogy to the cases shown in Figs. 6, 7, 8, and 9. In Figs. 6 and 7, r is less than l; in Figs. 8 and 9, r is greater than l. Figs. 6 and 8 represent "toe" conditions while Figs. 7 and 9 represent "flank" conditions.

In all four figures, the cam rotates about O, and A is the center of the arc MN, and the same construction is used to find the velocity. Line OC is drawn perpendicular to the "line of stroke" OE, to meet the "connecting rod" EA, or this link produced, at C. The velocity of the follower is equal to $\omega \times OC$. Line OC, therefore, represents this velocity to a scale 1 in. $= \frac{\omega}{12}$ ft. per sec. when the diagram is actual size. The scale calculation is exactly the same as in the case of the flat-faced follower discussed above. The corresponding velocity curves shown in Figs. 6A, 7A, 8A.

and 9A are drawn by plotting, as ordinates, OC and lengths similarly obtained for other angular positions.

The well-known Klein's construction is next applied to find the acceleration shown in the cases shown in Figs. 6 and 7, where r is not greater than l. With A as center and a radius equal to AC, an arc is drawn to meet a semicircle that has AE as its diameter. From the intersection at B, BF is next drawn perpendicular to EA, meeting the line OE at D. It can be proved that the follower acceleration equals $\omega^2 \times OD$. Line OD therefore represents this acceleration to a scale of 1 in. $= \frac{\omega^2}{12}$ ft. per sec. per sec. when the diagram is full size. Points on the acceleration curves of Figs. 6A and 7A are therefore found by plotting distances such as AC as ordinates at the corresponding angles.

Where r is greater than l, as in Figs. 8 and 9, Klein's construction becomes impossible, since no intersection of the arcs is obtained. This construction is, however, just a means of locating the point F on the line EA such that $AC^2 = AE \times AF$. In Figs. 8 and 9 this point is found as follows:

At E erect a perpendicular to AE. This line will intersect, at B, an arc drawn with A as center and radius AC. At B draw BF perpendicular to AB and meeting AE produced in F. Draw FD perpendicular to AEF, meeting OE produced at D. Evidently from the two similar triangles AEB and ABF,

$$\frac{AE}{AB} = \frac{AB}{AF} \text{ or } AB^2 = AE \times AF = AC^2,$$

since $AB = AC$.

Therefore F is the required point, and with FD drawn perpendicular to ACF, the follower acceleration equals $\omega^2 \times OD$.

Line OD is therefore plotted as an ordinate to obtain a point on the acceleration curve. Half scale can be used for plotting OD in order to save space.

The ratio of l to r governs the shape of the acceleration curve. Under conditions represented by Figs. 6 or 8, the acceleration remains approximately constant for about 25 deg. on either side of the dead center position when $\frac{l}{r} = 0.8$. The acceleration falls off when moving away from dead center, if this ratio is made larger (as in Fig. 6A), while a decrease in the ratio has the opposite effect (see Fig. 8A). For the flank condition of Fig. 7 the acceleration becomes about constant for 45 deg. movement on either side of dead center when $\frac{l}{r} = 3.5$. Fig. 7A shows that the acceleration is greatest on dead center position with a larger ratio. As point A is moved out to infinity, $\frac{l}{r}$ approaches unity. With all values of $\frac{l}{r}$ less than 3.5, the acceleration is least for dead center position. As A is moved in from infinity on the left-hand side so as to give a concave cam profile (see Fig. 9), the acceleration curve rises more and more rapidly from the dead center position.

In general terms, movement of the center of curvature away from the center of rotation tends to increase the acceleration except when the cam profile is concave. In this case, the opposite effect is obtained.

Quality not Quantity Will Help European Industry

By Magnus W. Alexander
President, National Industrial Conference Board

American mass production as a source of high "real wages" has captivated the minds of many European industrialists and economists to a point where it has become almost a fetish with them, and there is a widespread inclination to consider mass production a cure-all for all or many of Europe's economic ills.

Faced with an acute problem of under-consumption, European industrial and labor leaders are recognizing that the purchasing power of the wage earning population must be increased. It is realized that mass production in America greatly increased the wage earners' purchasing power by increasing industry's output per worker and hence the latter's earnings, as well as reduced living costs. To embark on a program of mass production, however, would require ample capital and abundant, readily available raw materials, the very two elements which in Europe are relatively scarce. On the other hand, Europe has an ample labor supply, evidently more than can be profitably employed.

But mass production is not necessarily the one and only way of achieving the desired end, which is essentially that of lowering the production cost per unit of output. The abundance of raw materials and of capital, together with large domestic markets, in the United States led to mass production as a natural development. But considering the comparably limited supply of raw materials and the relative scarcity of working capital in Europe, together with its ample labor supply, the task of European industrialists, as I see it, is to concentrate on quality production rather than quantity production. Production should be increased, to be sure, as markets broaden, but first of all unit-cost of production must be lowered by reducing overhead expenses and by improving technical processes. If in this manner production costs can be lowered sufficiently, not by reducing wages but by increasing industry's output per worker, it will make possible larger individual earnings per worker and domestic markets would improve because of the wage earner's increased purchasing power. Moreover, the manufactured products of the various European countries could, by virtue of the lowered cost of production, move more freely in foreign trade despite the many tariff barriers.

It is largely on the basis of such considerations as these that many of the post-war industrial consolidations in Europe have been and are being consummated. The new combinations, such as the gigantic new steel combine comprising the French, Belgian, German and Luxembourg steel interests, are intended to rationalize the industry by adjusting the productive capacity of the various member establishments to present markets and to the available working capital, by improving methods of production technically to the utmost degree, by producing fewer types of products but with a maximum degree of finish, and by concentrating the available resources on the works of greatest efficiency, closing down all others. In this manner, the larger European industries, like the chemical, the electrical and the coal industry in Germany, and the international steel cartel, are striving for more profitable production by increasing the industries' output per worker.

Some Applications of Pneumatic Tools at the C., St. P., M. & O. Shops

By Frank W. Curtis
Western Editor, *American Machinist*

A cylinder-boring rig—Attachment for milling axle keyways—Milling ports in valve bushings—Air-operated horizontal drill—Device for testing superheaters

AN EVIDENCE of the wide range of work to which compressed air is applied for machining purposes, may be ascertained in most railroad shops that handle major repairs. The devices described are miscellaneous air-operated tools used in the shops of the Chicago, St. Paul, Minneapolis & Omaha Ry., at St. Paul.

In reboring locomotive cylinders, the bores must be parallel with one another and in line with the frame, therefore, the boring unit must have adjustments to permit such alignment to be made. Another requirement is to have a feeding mechanism that will give a variety of feed changes. The air-operated rig shown in Fig. 1 has these features, and enables the reboring of cylinders to be done accurately and rapidly. The boring bar is mounted in bushings supported at both ends of the cylinder by brackets. The brackets are adjustable so that the bar can be aligned roughly with the bore. The fine adjustment is made by four screws in the hubs of the brackets, by which the boring-bar bushings are held. To test the alignment, an indicator, or tool, is mounted in the boring head and a test is made at each end of the cylinders by revolving the bar, then, if necessary, adjustments are are made to centralize the bar.

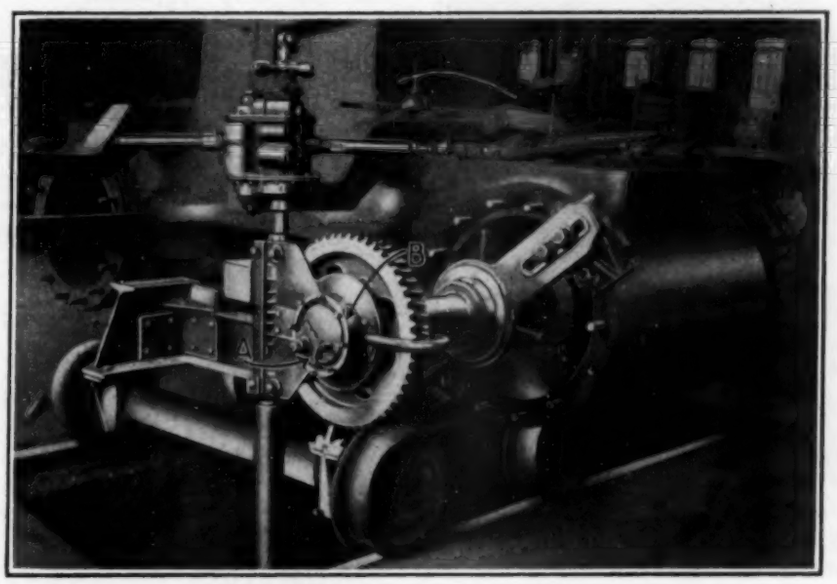


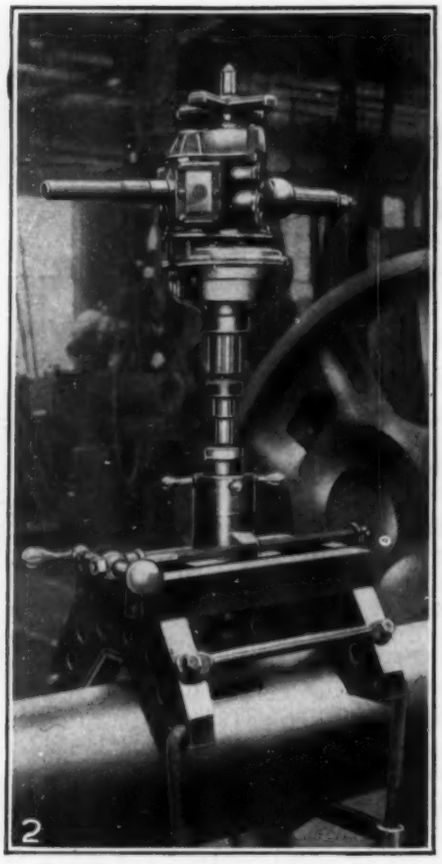
Fig. 1—Rig for reboring cylinders

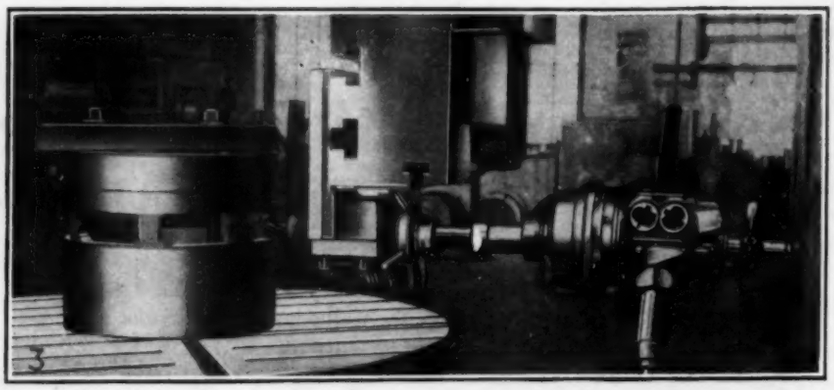
The drive is by worm gearing. The upper end of the wormshaft has a tapered shank on which an air motor is mounted. Feeding the boring head along the bar is accomplished through a feed screw located in a groove in the bar. The screw is actuated by the star wheel *A*, though instead of one pin for it to strike against, there are eight, all mounted in the stationary ring *B*. By removing each alternate pin, the amount of feed will be only half as great as if the eight pins were left in place. Further variations can be made by using either star wheels or rings containing varying numbers of teeth, or pins, respectively. A boring head having three tools is used for the roughing cut and a single goose-neck tool is used for the finishing cut. Approximately 0.01 in. of metal is removed in the finishing cut. There are two sizes of boring rigs used, accommodating cylinders ranging from 18 to 27 in. in diameter. Each rig is equipped with an adjustable spider that permits clamping to the cylinder so that the ends can be faced, and to permit the boring of valve bushings.

The portable, air-operated device shown in Fig. 2 is used to mill keyways in driving axles. The device is clamped to the axle as shown, the bottom being shaped in Vs for alignment. Ways are provided so that the spindle can be raised and lowered for depth of cut and can be traversed lengthwise for the length of the keyway. The feed is by a screw and a handwheel. The air motor is attached to the upper end of the spindle.

For machining the ports in valve bushings, a Dill slotter, equipped with an air-operated attachment is employed, and in Fig. 3 is shown the set-up. The work is clamped centrally on the table by a U-strap and two bolts. The cutter spindle is carried in a bracket in the ram of the slotter. The feed screw, at the rear of the motor, abuts the column of the machine and acts also as an outboard support. The vertical adjustment of the cutter is obtained by movement of the slotter ram, and radial location of the ports is determined by the graduations on the machine table.

Tell-tale holes, $\frac{3}{32}$ in. in diameter, are drilled in the ends of staybolts in the home-made machine illustrated





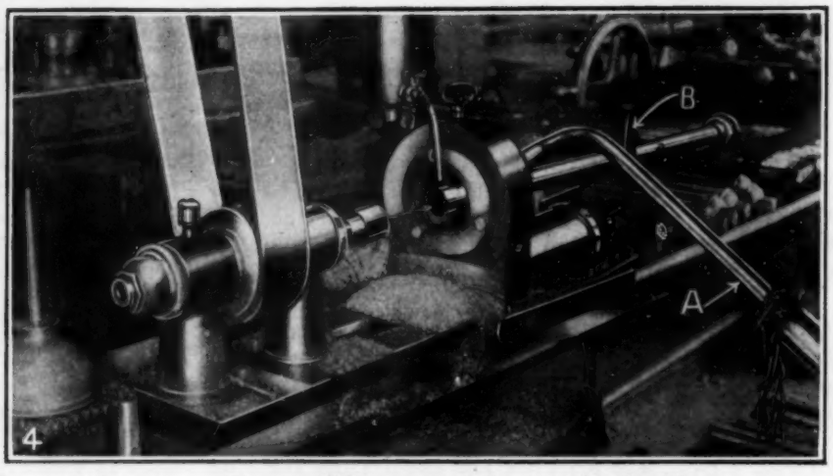


Fig. 2—Portable device for milling axle keyways. Fig. 3—Milling port holes in valve bushings. Fig. 4—Horizontal drill with pneumatic feed

in Fig. 4. The base of the machine is a cast-iron block, on one end of which is mounted a horizontal, belt-driven spindle. In the center of the block is a three-jawed universal chuck, operated by the lever *A*. The chuck is in a holder arranged so as to be moved lengthwise of the bed by an air cylinder, controlled by the lever *B*. This arrangement constitutes the feed. The cylinder has a small-sized air inlet so that the work will not be presented to the drill too suddenly. Holes varying from 1¼ to 4 in. in depth are drilled in different types of staybolts in this machine. Oil, used as a cutting lubricant, is fed to the drill from the small tank mounted on the chuck holder.

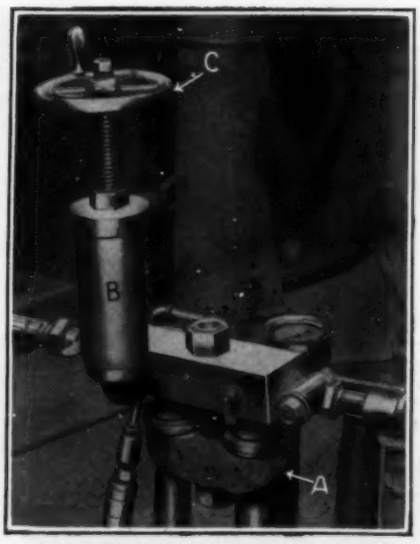


Fig. 5—Testing superheater units

Superheater units are tested by the device shown in Fig. 5. The tester body is clamped on the end of the unit by a bolt passing through the clamp plate *A*. Fiber gaskets are used to insure a tight joint. The unit is filled with water through the inlet at the left-hand end of the body at 100-lb. pressure. After the unit is filled, the water-inlet valve is closed and the pressure is built up to 400 lb. by the screw-operated pump *B*. The pressure is indicated by the gage shown at the rear of the testing body. After completion of the test, the outlet valve is opened and the water is forced out by air pressure.

Simplified Tool Setting—Discussion

BY ARTHUR SILVESTER

Referring to the article by Donald A. Hampson under the title given above, and published on page 26, Vol. 65, of the *American Machinist*, I think Mr. Hampson is wrong when he says: "Attempts to reduce this non-productive time are made by all foremen and planners, but it is equally well known that *unless foremen keep right after the men on these things, they eventually slip back to the old ways if it is possible to do so.*" The italics are mine.

The men in most shops are on piecework or some sort of inducement for speeding up production, and in many shops there is a time schedule for setting up the work.

In regard to the man leaving his machine idle while he grinds his tool; occasionally this cannot be avoided, but in my experience, men usually have duplicate tools and grind one while the other one is in use. While the standard type of tool clamps with four studs and nuts is by no means perfect, the toolholder shown by Mr. Hampson would not be tolerated in shops where a variety of planer operations is done.

Gear Teeth in Action

By Earle Buckingham
Associate Professor of Engineering Standards and Measurements
Massachusetts Institute of Technology

Calculating speeds and loads in planetary gearing—The potential work done by the planet gears and pinions is many times the actual work transmitted

THUS FAR we have been considering this subject ignoring weight and friction. For most simple drives, such as single pairs and short trains, these factors can be safely ignored because the weight of the gears themselves is but a small part of the total load and the friction losses between the gear teeth are but a very small part of the total friction loss in the mechanism. With well-made gears these friction losses should not exceed about one per cent of the power transmitted at each mesh.

When the type of the gear drive departs from simple pairs and trains, however, very high tooth loads are often built up in combination with a much higher velocity of tooth engagement than the velocity at which the load is actually transmitted. In such cases a careful analysis should be made, and the friction losses should be included. For purposes of such an analysis, we will use a friction loss in the action of the gear teeth equal to one per cent of the tooth load at each gear mesh. This should represent a fair average under normal conditions of speed, method of lubrication, and load, such as are encountered in general machine practice.

In addition to the analysis of tooth loads, the determination of the relative speeds of the driving and driven gears becomes more complex as we depart from simple pairs and trains. We will therefore consider this phase of the subject also in addition to the tooth loads and friction po er losses.

One of the most complex types of gear trains to analyze is that known as planetary gearing, or epicyclic gearing as it is also commonly called. Planetary gearing is composed of a train of gears where some of them revolve on fixed centers while others revolve on moving centers. Planetary gear trains may be arranged in a great variety of ways. In Fig. 14 is shown one arrangement of this type of gear train consisting of spur gears.

The gears that rotate on moving centers are known as planet gears or pinions while those that revolve on fixed centers are known as sun-gears. One of the sun-gears is usually fixed. The planet pinions are carried on an arm that is keyed to the driving shaft, while the moving sun-gear is keyed to the driven shaft. The following notation will be used throughout in the analysis of planetary gear trains:

F = fixed sun-gear
S = moving sun-gear
Pf = planet pinion meshing with fixed sun-gear
Ps = planet pinion meshing with moving sun-gear
A = arm carrying planet pinions. In Fig. 14, it is the driving member.

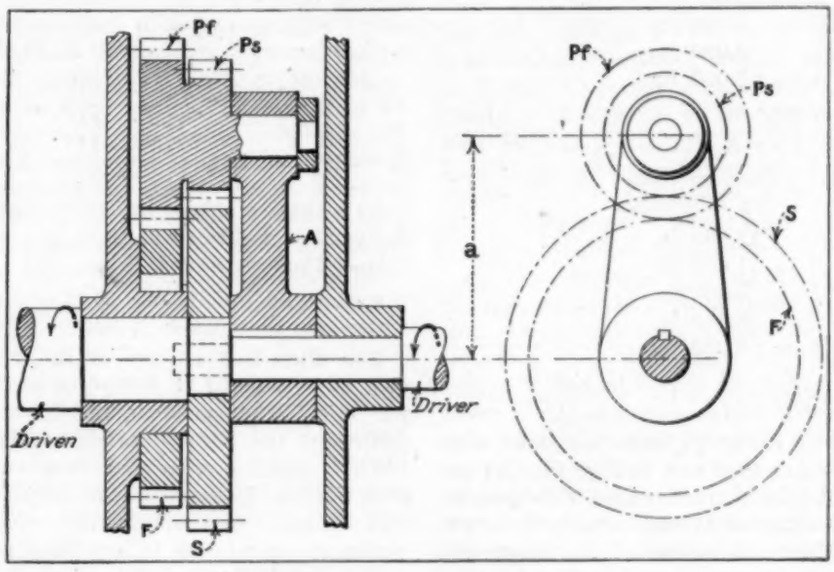


Fig. 14—Typical planetary gear train

When these symbols are used in equations, they will represent the pitch diameters of the gears in inches and a will represent the center distance between the sun-gears and planet pinions in inches.

We will first determine the reduction ratio of the train shown in Fig. 14. The simplest method on any planetary train is to consider all of the gears in the train as locked together and the entire combination revolved for one turn. As one member of the train is fixed, this member F must then be revolved back one turn while the driving arm A is held fixed. The arm A has then made one revolution while the moving sun-gear S has made one revolution plus or minus the amount it moves when the fixed sun-gear is returned to its original position. This amount is determined just as if the gears were a simple train and is the amount the moving sun-gear revolves for each revolution of the arm A.

In the example shown in Fig. 14, when all of the gears in the train are locked together and revolved for one

The fifth article. The sixth will appear in an early issue.

turn, the driven shaft will make one turn in the direction of the driver. Then when the arm A is fixed, and the sun-gear F is revolved for one turn in the reverse direction, the sun-gear S will also be turned backwards an amount depending upon the ratio in the gear train between F and S considered as a simple train. This amount is equal to $\frac{F \times Ps}{Pf \times S}$.

Whence reduction ratio $= 1 - \frac{F \times Ps}{Pf \times S}$.

When the result obtained from this equation is plus, the driven member will revolve in the same direction as that of the driving member. When the result is minus, the driven member will revolve in the opposite direction to that of the driving member. In the construction shown in Fig. 14, when F is smaller than S, the final drive will be in the same direction as the original one; and when F is larger than S, the driven shaft will rotate in the opposite direction to the driver.

As a definite example, we will determine the reduction ratio of a planetary gear train as shown in Fig. 14 with the following values:

$F = 11.000$ in.
$S = 12.000$ in.
$Pf = 5.000$ in.
$Ps = 4.000$ in.
$a = 8.000$ in.

$$\text{Reduction ratio} = 1 - \frac{F \times Ps}{Pf \times S} = 1 - \frac{11 \times 4}{5 \times 12} = + \frac{4}{15}$$

If we reverse these values so that F is the larger sun-gear we would have the following:

$F = 12.000$ in.
$S = 11.000$ in.
$Pf = 4.000$ in.
$Ps = 5.000$ in.
$a = 8.000$ in.

$$\text{Reduction ratio} = 1 - \frac{F \times Ps}{Pf \times S} = 1 - \frac{12 \times 5}{4 \times 11} = - \frac{4}{11}$$

We will now consider the tooth loads that exist with a planetary train of gears as shown in Fig. 14. As our first example we will take a train where F is smaller than S. In Fig. 15 a diagram of such a train is shown.

We will only consider the extent of the tangential tooth loads on these planetary trains. The bearing pressures would be determined from these tooth loads in exactly the same manner as for simple trains.

In effect, in the planetary gear train shown in Fig. 15, the pitch point on the fixed sun-gear F is the fulcrum of a lever. The driving force is acting on the center of the planet pinions to pry the moving sun-gear S ahead. At the right in Fig. 15 is shown the diagram of a simple lever that represents these conditions. The force W_1 is the driving force and W_2 is the tangential tooth load on the driven sun-gear S, while the difference between them is the tooth load on the fixed sun-gear F, because force W_1 acts in the opposite direction to force W_2, hence W_3 is equal to their difference. We know from a simple lever that $W_1 \times b = W_2 \times c$; and $W_3 = W_2 - W_1$. We have from the diagram

$$c = \frac{S - F}{2} \quad \text{and} \quad b = \frac{2A - F}{2}$$

$$W_2 = \frac{b}{c} W_1 = \frac{2A - F}{S - F} W_1 \quad \text{and} \quad W_3 = W_1 \left(\frac{2A - F}{S - F} - 1 \right)$$

When we know the amount of power to be transmitted and the speed of either the driving or driven shaft, we can determine the magnitude of these loads. Thus when

$hp.$ = horsepower
$r.p.m.$ = revolutions per minute of driving shaft
V = velocity in feet per minute of point of application of driving force.

$$V = \frac{2\pi a \times r.p.m.}{12} = 0.5236\, a \times r.p.m.$$

$$W_1 = \frac{33{,}000\ hp.}{V} = \frac{63{,}025\ hp.}{a \times r.p.m.}$$

As a definite example we will assume that a planetary gear train with the following values is to transmit 2 hp. when the driving shaft revolves 1,200 rev. per minute:

$F = 11.000$ in.
$S = 12.000$ in.
$Pf = 5.000$ in.
$Ps = 4.000$ in.
$a = 8.000$ in.

We have already seen that the reduction ratio for such a train is plus 4/15. In this example the driven shaft will revolve $4/15 \times 1{,}200 = 320$ r.p.m. in the same direction as the driving shaft. We therefore have for the loads:

$$W_1 = \frac{63{,}025 \times 2}{8 \times 1{,}200} = 13.13 \text{ lb.}$$

$$W_2 = 13.13 \left(\frac{16 - 11}{12 - 11} \right) = 65.65 \text{ lb.}$$

$$W_3 = 13.13 \left(\frac{16 - 11}{12 - 11} - 1 \right) = 52.52 \text{ lb.}$$

As a check on these loads we know that the sun-gear S revolves at 320 revolutions a minute and transmits 2 hp. Thus we have

$$W_2 = \frac{63{,}025 \times 2}{6 \times 320} = 65.65 \text{ lb.}$$

The pitch line velocity of the sun-gear S about its own axis is equal to $0.5236 \times 6 \times 320 = 1{,}005$ ft. per min. The speed of the tooth engagements that determine the power loss due to friction of the gear teeth is much higher than this, however. This pitch line velocity of engagement, which will be called Ve, will be equal to the pitch line velocity of the planet pinion Ps in relation to any fixed point on the arm A.

This pitch line velocity of the planet pinion Ps is controlled by that of the planet pinion Pf, which meshes with the fixed sun-gear F. These pitch line velocities of the two planet pinions will be directly proportional to their diameters. The pitch line velocity of the planet pinion Pf is equal to the product of the pitch circle circumference of the fixed sun-gear F and the speed of the arm A. Whence the pitch line velocity of engagement of the planet pinion Pf is equal to

$$\frac{\pi F \times r.p.m.}{12} = \frac{3.1416 \times 11 \times 1{,}200}{12} = 3{,}456 \text{ ft. per min.}$$

The pitch line velocity of engagement Ve, of the planet pinion Ps is equal to $3{,}456 \times Ps/Pf = 2{,}765$ ft. per min. With a pair of gears operating on fixed centers at this pitch line speed with the tooth load of 65.65 lb., these gears would be transmitting $65.65 \times 2{,}765 = 181{,}522$ ft.-lb. per min. This result is what we may call the potential work accomplished. The actual work is 2 hp. or 66,000 ft.-lb. per min. In this example the potential work is nearly three times as much as the actual. Assuming one per cent power loss due to tooth friction, we would lose at this mesh 1,815

ft.-lb. per min. In order to deliver 2 hp. to the driven shaft, this additional power must be transmitted through the first pair of gears.

At this first pair also, the potential power is greater than the actual. *Ve* here is 3,456 ft. per min., while the tooth load is 52.52 lb., whence the potential power transmitted is equal to 52.52 × 3,456 = 186,909 ft.-lb. per min. plus 1,815 ft.-lb. per min., making a total of 188,724 ft.-lb. per min. Using the same factor of one per cent as before for the power loss due to tooth friction, we have a power loss in the first pair of gears of 1,887 ft.-lb. per min. This added to the loss in the second pair makes a total loss of about 3,702 ft.-lb. per min., or about 0.11 hp., when transmitting 2 hp. to the driven shaft.

Furthermore, in order to carry this tooth load at the speed developed for tooth engagements, both pairs of gears must be of such a size that they would transmit about 6 hp. safely as a simple pair on fixed centers. In other words, with a reduction of about four to one, the potential power that must be transmitted by the gear teeth is about three times the actual power transmitted. A single pair of gears that would give the same speed reduction would have a power loss due to tooth friction of about 0.02 horsepower.

In design, this construction of planetary gear trains will give large variations in speed in either direction within a very small compass. The large amount of potential power that must be handled together with the resulting power losses make such trains very inefficient and also much bulkier than might seem at first glance if they are used to transmit any great amount of power with any large variations in speed. These trains have their chief value for use where the loads are intermittent and power losses are of minor importance, such as in chain hoists, and also where the loads are very small and a large reduction is required in a minimum space.

As the speed ratio is increased, the power losses also increase. As a second example, we will determine the tooth loads and power losses on a similar planetary train that gives a reduction of about 30 to 1 instead of 15 to 4, and that is to transmit 2 hp. at 1,200 r.p.m. of the driving shaft. Such a train might have the following values:

F = 12.000 in.
S = 12.100 in.
Pf = 4.000 in.
Ps = 3.900 in.
a = 8.000 in.

$$\text{Reduction ratio} = 1 - \frac{F \times Ps}{Pf \times S} = 1 - \frac{12.0 \times 3.9}{4.0 \times 12.1} = + \frac{4}{121}$$

Referring again to Fig. 15,

$$W_1 = \frac{63{,}025\ hp.}{a \times r.p.m.} = 13.13 \text{ lb.}$$

$$W_2 = W_1 \left(\frac{2a - F}{S - F} \right) = 13.13 \left(\frac{16 - 12}{12.1 - 12} \right) 525.20 \text{ lb.}$$

$$W_3 = W_2 - W_1 = 525.20 - 13.13 = 512.07 \text{ lb.}$$

As a check on these loads, the driven gear S revolves 1,200 × 4/121 = 39.67 r.p.m., whence

$$W_3 = \frac{63{,}025 \times 2}{6.05 \times 39.67} = 525.20 \text{ lb.}$$

The pitch line velocity of engagement *Ve* of the planet pinion *Pf* is equal to 0.5236 × 6 × 1,200 = 3,770 ft. per min.

The pitch line velocity *Ve* of the planet pinion *Ps* is equal to 3,770 × *Ps*/*Pf* = 3,676 ft. per minute.

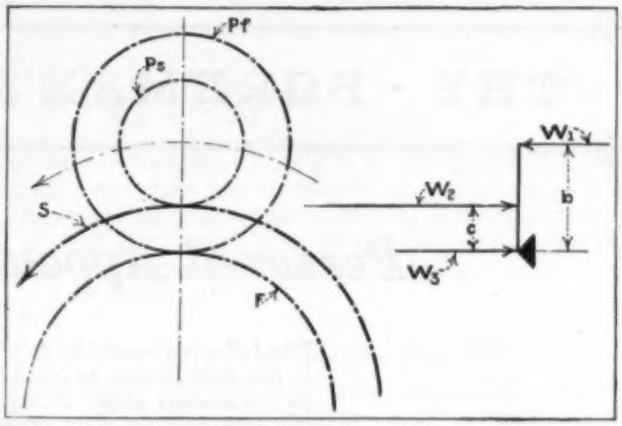


Fig. 15—Lever analogy applied to planetary gear train

With a tooth load W_2 of 525.20 lb., the potential power transmitted by the second pair is equal to 525.20 × 3,676 = 1,930,635 ft.-lb. per min. A power loss of one per cent at this mesh is equal to 19,306 ft.-lb. per minute.

With a tooth load W_3 of 512.07 lb., the potential power transmitted by the first pair is equal to 512.07 × 3,770 = 1,930,504 ft.-lb. per min. plus 19,306 ft.-lb. per min., making a total of 1,949,810 ft.-lb. per min. A power loss of one per cent for this pair would amount to 19,498 ft.-lb. per min., making a total power loss due to tooth friction on this train of 38,804 ft.-lb. per min., or about 1.18 hp., when transmitting but 2 hp. In other words, the power input must be 3.18 hp. to deliver 2 hp. to the driven shaft. A simple reduction train of three pairs would have a corresponding power loss of about 0.06 horsepower.

In this example, the potential power transmitted through each pair is about thirty times the actual power with a reduction ratio of about thirty to one. As the reduction ratio increases, the potential power transmitted will have about the same ratio to the actual power as the reduction ratio. Thus in a planetary gear train of this construction with a reduction of 100 to 1, the potential power transmitted through each pair will be about 100 times the actual power. With a one per cent power loss when transmitting 2 hp., the friction loss on the gear teeth alone would amount to about 4 hp., thus requiring an input of 6 hp. to deliver 2 horsepower.

Co-operation Amongst Foremen

By J. C. P. Bode

Foremen of different departments who have to work hand in hand in order to keep the product moving efficiently should get together on their own initiative and adjust their ideas without necessary pressure from the top. Only too often have I observed that one foreman dealing with another daily, will air his grievances to the man higher up, and out of a clear sky the other foreman will be called on the carpet for something that he would gladly have done differently without argument had his fellow foreman explained matters to him.

Such actions are an annoyance all around. The complaining foreman may have done it to show he is on the job, and may feel that he is getting himself well thought of higher up and in line for something better, but he will nevertheless find himself on thin ice before he knows it. The other foremen will no longer trust him.

THE · FOREMAN'S · ROUND · TABLE

Personal Appearance in the Shop

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"THIS matter of dress, Al—and personal appearance in general. I felt rather bawled out when Williams told me to get after that apprentice the other day. Objected to his greasy overalls. I knew that his clothes go to the laundry only once a month, but considered it none of my business—besides, he and his mother need every cent they can get. Told that to Williams—told him, too, that the kid'll get a raise pretty soon and I'd rather wait and see if he spends some of it on keeping his clothes clean than to speak to him about it now."

"Good for you, Ed," interrupted Al, his fellow foreman. "I know without your saying so that Williams OK'd your suggestion. I know, too, that it made a hit with him."

"You're right, Al. All he said was, 'That's a good idea.' But I could see he was pleased. That rather pepped me up and I kept right on thinking. Decided that if the apprentice makes an impression on the superintendent, the foreman must make a much bigger one, and that his example must influence the men. Then I thought of the possibilities of the effect of an orderly department on the quality of the work, on visitors to the shop, especially prospective purchasers, and finally of the effect on the community. I even thought something about the higher type of citizenship that it seemed would naturally follow personal pride. Didn't know that I could think so far ahead.

"I remembered hearing that the superintendent of a famous plant believed every foreman should wear a white collar. That led me into thinking about shaving every day, keeping my shoes shined, my clothes pressed, my hair cut, getting rid of that old pet hat—and a lot of other things. I'm not through thinking yet, but I'd like to get your opinion on what I've said, Al."

"Can't be done, Ed—at any rate, it won't be done. I have some very definite opinions on those subjects, but I'm going to keep them bottled up for a while. Don't get the wrong idea—I just want you to keep on thinking for yourself, without too much outside help."

Why was the superintendent pleased at Ed's suggestion about the apprentice? Is Ed wasting his time in thinking about white collars, shoes, hats and so on? What was in the mind of the superintendent who thought every foreman should wear a white collar? Is it possible that such a thing as personal appearance in the shop can be a thing big enough to influence visitors, buyers, the community, and finally the quality of citizenship? Or is Ed undergoing a period of temporary mental aberration? What would have been Ed's mental reaction if the Super had scoffed at his suggestion about the apprentice, and had insisted that he be told at once to keep his clothes clean?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Keeping Machines on the Job

IN ORDER to keep machines on the job it is necessary to maintain them in the best of condition. The old proverb, "A stitch in time saves nine," is very applicable to machinery. While breakdowns cannot be prevented entirely they can be reduced. Frequently an examination for wear and to determine the amount of lubrication will prevent a lot of machinery from being run off its feet when the timely renewal of a bolt or stud will save the machines.

Machine operators should be encouraged to take pride in the machine which they operate. We have noticed that when we have a man who takes pride in his machine, keeps it well oiled and cleaned up, and who makes any minor repairs that are evident, the machine which he operates will be the one from which we get the best and most consistent production. Very often the foreman will find that the good points of the slovenly man are merely lying dormant and can be brought out by individual attention, and by a few encouraging words.

I don't think that it is good shop practice to have the repair man under the direction of the shop foreman. It can be taken for granted that a good repair man has a better knowledge of the details of a machine than the average shop foreman, and for this reason it is better for the repair man to be held responsible for any repairs made or necessary to be made.—CLYDE D. THORBURN, *Canada.*

Letting a Man Try His Own Way

THERE are occasions when Ed would be right in insisting on a job being done the way he wants it done. These would be on such occasions as those when suggestions are made that have been tried before. He should, however, explain the difficulties to be encountered and the reasons for the failure of a suggestion that has been previously tried out.

As a general rule the attitude that Ed adopts is wrong. A wise foreman is also a fellow worker. The disciplinarian and school teacher attitude suggested by the methods that Ed uses in his department will only result in the stifling of all initiative and result in a heavy labor turnover. Al was right in giving encouragement to Jimmie and in allowing him to try his own methods. A foreman should welcome any practical suggestion with regard to any job or methods for the good of his own department.

In conclusion, workmen realize it is not possible for the best of foremen to be right all the time or to know it all. But they like to hear him admit it once in a while. It is a good thing for the foreman to say, "I'm not sure, but I think that this is the best way to do the job."—ARTHUR SYLVESTER.

Letting a Man Try His Own Way

I BELIEVE Al's theory of letting Jimmy Johnson do the job his own way is better than to try to make him do it the way his foreman suggested, provided, of course, that Jimmie's way is as efficient and does not increase the tool and labor costs. I assume that Jimmie is loyal to his foreman as well as to the company for which he works and when he suggests what he believes is a better way he does not do it just for an argument nor does he spend the company's time telling his fellow workers how little the foreman knows about the job.

Ed takes his foremanship too seriously and he tries to rule his men with too much of an iron hand. By doing so he kills all initiative in the conscientious workman. Ed should be willing to accept any suggestions for better methods and if the suggestion is not a good one, the workman should be shown why and encouraged to continue thinking about his work.

Since the management's dealings with the workman are through the foreman and also the attitude of the workman to the company is controlled by the foreman, it is necessary that the man who holds the position of responsibility should be a broad-minded individual who is not afraid of losing his position by allowing his workmen to make suggestions and who also sees to it that the conscientious workman is rewarded. This is the kind of man who will later be picked for the job of superintendent.—WILLIAM E. KELVIE.

Where Shall We Start Apprentices?

I HAVE seen the experiment of starting boys on assembly work, as suggested by Al, tried several times and it did not always work to the best advantage for the boy. Why? As all foremen know, the natural interests and the traits of boys vary widely. Some boys, if started in the erecting shop first, are very quick at learning and will make themselves very handy. It is true that they soon get to know the names of parts and where to get them. With a little supervision they soon learn how to assemble them and in a few weeks they become very useful to the erector. If the erector is of a fatherly type, he will encourage the

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THE · NEXT · TOPIC

Should Foremen Be Good Actors?

QUESTIONS

To what extent can an experienced foreman change his style of addressing his men?

Is it wise for him to attempt to act the part of a different type of foreman in order to conform to certain general requirements?

Will the men be quick to recognize the "acting"?

If so, what will be their reaction?

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boy and praise him to such an extent that the boy is likely to become swelled-headed and to think he is really doing something. To shift such a boy onto such work as bolt cutting or nut shaping would, in some cases, break the boy's heart.

The best way of training apprentices and the way which I have used for thirty years with very marked results, is to start the boy at the bottom, that is, the hacksaw, the shaper or on simple lathe work. He then learns how to grind his tool, how to set it in the tool-post and learns the varying results secured by different methods. I do not keep him too long upon one job. In my own case it is easy for me to supply the apprentice with a variety of jobs, since the shop in which I am employed does general engineering work. This is most important with boys, since the frequent change of jobs will give them a greater interest in their work. He will feel that he is really learning something and will be getting a thorough acquaintance with his trade.

I use such periodicals as the *American Machinist* as a basis for home study. I ask him questions on articles in which he should be interested. In this way I can conform to my rule of teaching him something every day. When he realizes that one is never through learning in the engineering profession he is not so apt to lose his head or to become difficult to teach. The boy will look up to you as being superior in knowledge and as being a good instructor.—H. MAPLETHORPE, *England.*

Letting a Man Try His Own Way

ED IS wrong in requiring his men to perform their work by his own methods. First, his method will prevent the development of new and better ideas suggested by his men, and second, his method is psychologically wrong.

The efficiency of our industrial organizations today is due mainly to the aggressiveness of the American workman. Suppose that in the last century each generation had been required to perform work in the same manner as its forefathers. How much more efficient would our industrial organization be today than then?

The workman should not be allowed to run wild with his ideas. There should be certain limits to the freedom allowed him. He can be controlled by being required to complete his task within the standard time allowed. If the shop has a wage incentive system in force, this becomes a very easy matter. The employee should be further controlled by requiring his work to be up to standard. He should not be allowed to use methods which are certain to materially decrease the life and efficiency of the machinery and tools.

The writer is acquainted with a manager who never instructs his subordinates concerning the details and methods to use in doing a job. He merely informs them of the results that he wishes and when he desires the job to be completed. He makes his men responsible for each task, in fact, he encourages them to use their own initiative and to express their own ideas. As a result, these men will do much more for him than they will for anyone else. Many of his men have been known to work for twenty-four hours or more to get out an extremely important job. He has no labor turnover. His present organization has been with him for the past four years or more, with the exception of additional men who have been hired from time to time as the amount of business increased. Does allowing a man to express his own ideas pay?

By giving a man a little responsibility and freedom he will become one of the company's most ambitious, loyal and dependable employees. Why? Because he is achieving things that are the result of his own efforts and ideas.

A young engineer with less than two years of actual industrial experience went into a spring shop and doubled the production on many operations by simply rearranging a furnace, by changing the location of material trucks and by providing inexpensive tools. His hardest job was to overcome the objections set up by the supervision which was composed of old experienced spring makers.—H. J. FAUSNAUGH.

Picking Assistants

AN ASSISTANT should, whenever possible, be selected from the ranks for if the policy is pursued of drawing them from the outside, it will most certainly react upon the men and cause them to lose interest in their work. They will see nothing ahead of them except pay day and closing time. Many valuable ideas can be obtained from the men who work at the bench but these ideas will not be forthcoming unless they can see where it will be to their advantage to bring them to the attention of the management.

A competent foreman should not be prejudiced by occasional outstanding happenings, whether favorable or unfavorable, but should be so thoroughly conversant with his employees' qualifications that he could decide upon the man to promote without maintaining a system of records, which is certain to be more or less cumbersome.

Any superior should have a man or men who can take his place temporarily should the occasion arise. There is no need for an executive to fear having such an assistant, for if he is conducting his work in a proper manner, he will not be subjected to comparison. The management is interested in results far more than it is in the details of how they are obtained. On the other hand, should the management find that one of its departments fails to function properly during the absence of its chief, it will promptly see to it that a competent assistant is placed therein. It is much better that the foreman select his own assistant, not only from his own standpoint but from that of the company as well, for he is the best judge of what the qualifications of that assistant should be and will be certain to select someone who will be congenial to himself and to his subordinates.—D. L. PARKHURST.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Soldering Fixture for Radio Shields

BY OLIVER FRANKLIN

In multi-stage radio sets, it is necessary to separate electro-statically and magnetically the respective stages of radio frequency amplification, in order to prevent distortion from the presence of stray inductance. Hence each unit should be inclosed in a copper box, which acts as an effective shield. In the present example this box is made by soldering together three stamped pieces; a 3-sided piece, the fourth side, and the cover. The bottom is left open so that the box can be dropped over the apparatus to be shielded. Fig. 1 shows the three pieces before assembly. The material is 24-oz. (0.0322 in.) hard sheet-copper, tinned on one side. Besides adding to the appearance of the box, the tinning aids the soldering operation. In Fig. 2 the three pieces are assembled in a fixture and are ready for soldering. The fixture is a hollow, rectangular, box-shaped affair made of cast iron. It is mounted on and pivoted about a pin in a cast-iron angle bracket that is tilted about 15 deg. from the vertical. The three parts are slapped in place very quickly. First the single-sided piece is placed on the upper side of the fixture, then the 3-sided piece is put in place with its turned-over edges gripping the first piece. The cover-piece comes last and its turned-over edges inclose all four sides of the shield. Two, flat steel spring-clips are snapped against the two ends of the box and over the cover, so as to hold the entire assembly in place.

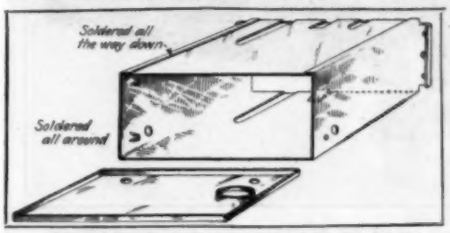


Fig. 1—Parts of a radio shield

The usual zinc-chloride flux is run along the seams, and the solder is applied in wire form. As soon as one side is finished, the fixture is rotated to bring the adjacent side on top, and so on. The soldering irons are heated by gas, and two or three are needed as the copper rapidly conducts the heat away from the iron.

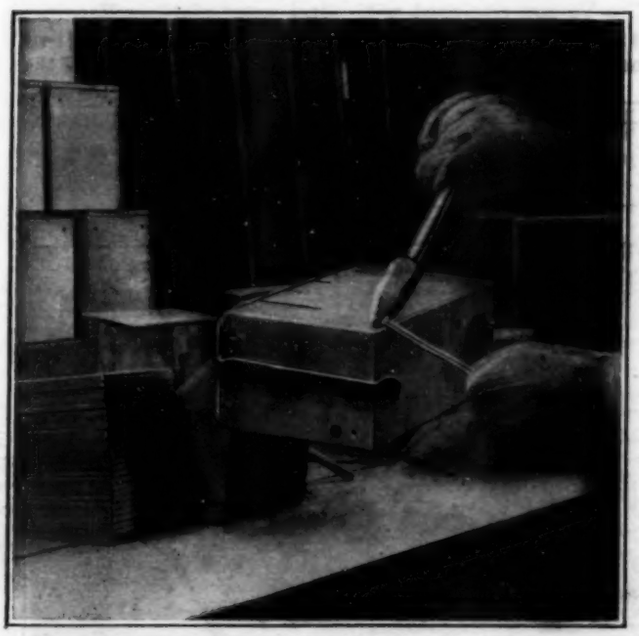


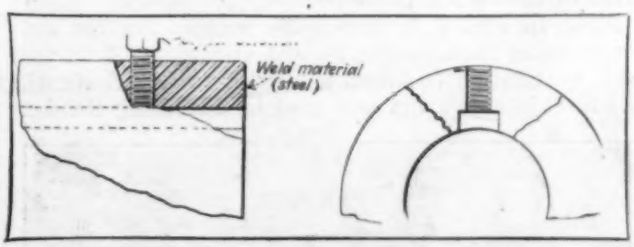
Fig. 2—Soldering fixture for radio shield

Molding Threads in a Welding Job

BY HARRY GONSER

The illustration shows a difficult welding job we got away with and which may be of interest to machine-shop foremen.

A motor was in a steel-mill maintenance shop for repairs. The shaft was being pressed out of the rotor,



A difficult job of welding

and one of the men failed to slack off the setscrew that bound the key. What happened was that a good-sized piece of cast iron split off, carrying the setscrew with it.

We welded the job by the Stable Arc process. The first thing we did was to make a copper setscrew and put it in the position where the steel setscrew belonged. Then we built up around the copper setscrew until we had replaced the metal broken out. The copper setscrew was then backed out without difficulty, since the weld metal would not stick to it, and the steel setscrew was put in place.

We thus avoided the difficult operation of drilling and tapping through the line of fusion of the weld. The copper setscrew acted as a core and made the thread.

Removing a Broken Stud

BY GEORGE WILSON

Here is a kink on removing a broken stud in an awkward place, that might prove helpful to someone else. The stud was ⅝ in. and the threaded end had broken off, leaving about 1 in. projecting above the casting. The casting was the head of a small compressor used in an ice plant, and had two cast necks projecting from the surface carrying the stud. In addition to the cast outlets, there were two valve bonnets held on by similar studs. This construction made it impossible to swing any kind of a wrench on the stud, which was rusted fast.

The scale was cleaned from the stud and a socket wrench was made by drilling a ⅞-in. hole in the end of an 1¼-in. square bar. The drilled end of the bar was heated to a bright red and driven down over the stud. Cooling the bar shrunk it tightly on the stud. A wrench applied to the upper end of the bar removed the stud without difficulty. The wrench held about all the stud would stand without twisting off, and showed no signs of letting go.

Contour Shaping

BY J. MADDEN

In Figs. 1 and 2 are shown two views of a fixture used for contour shaping by the Magnetic Signal Co., Los Angeles, Calif. The piece being machined is a laminated magnet that is one component of a railroad warning device used at crossings and known as the "Magnetic Flagman." The magnet causes oscillation of the armature to which is attached the warning pendulum. Fig. 1 shows the cam side of the fixture and Fig. 2 shows the clamping side.

A counterweight holds the tracer against the cam, and actuation of the shaper cross-feed causes the tracer to follow the cam, resulting in a partial rotation of the fixture. The length of the cam lever and the location of the point of its application to the fixture affect the shape of the contour machined.

At *A* in Fig. 3 is shown the magnet for the a.c. device being machined in Figs. 1 and 2. At *B* in the same illustration is shown a magnet for a d.c. signal, and at *C* is shown the cam used in machining the d.c. magnet. The cams are held to their support by two pins shown in Fig. 3 and are put on and detached quickly, without recourse to tools.

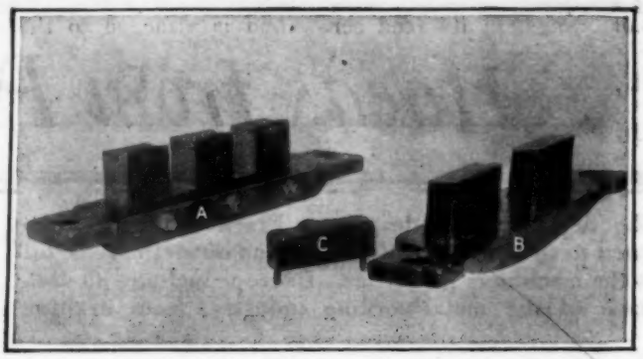


Fig. 3—Two of the magnets and a cam

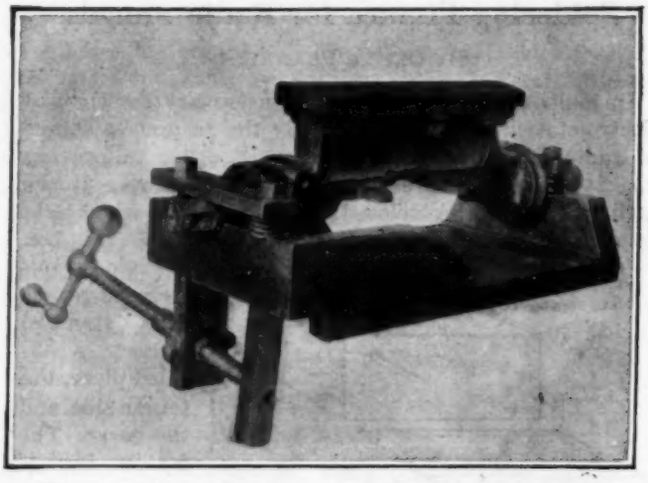


Fig. 4—Fixture used in machining a.c. armature

In Fig. 4 is shown another shaper fixture used for machining the armature for the a.c. device. An armature is shown in position in the fixture. The surface machined is an arc of a circle. In this device the journals of the armature rotate in Vs of the fixture. The Vs are equipped with steel wear plates. Rotation is brought about by turning the ball crank. By this means, the vertical rectangular bar, which supports the

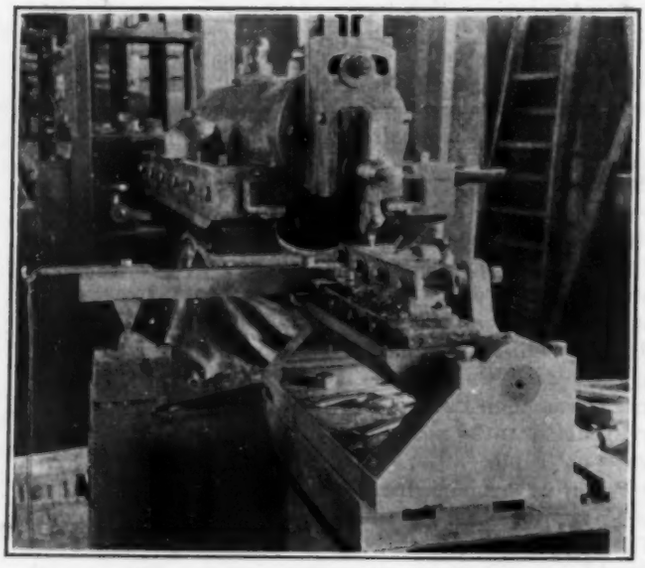


Fig. 1—Operator's side of machine, contour shaping

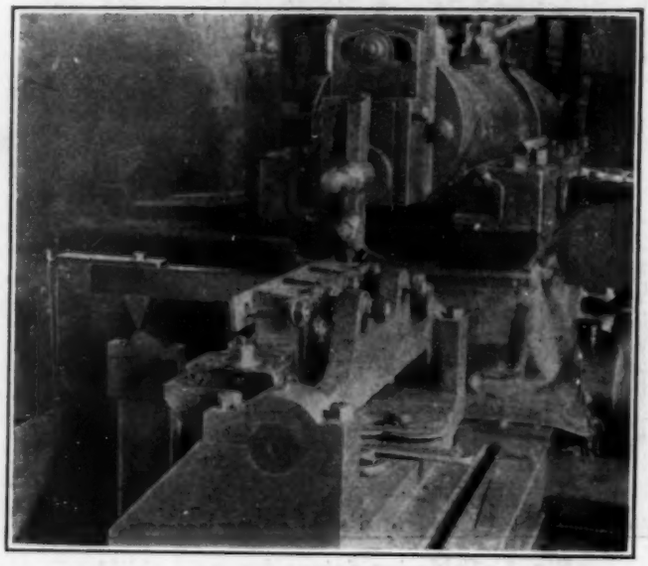


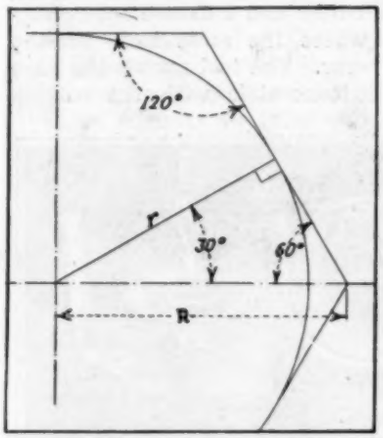
Fig. 2—Cam side of machine, contour shaping

ball crank and its feed screw and is attached to the armature, causes the armature to rotate through the required number of degrees. The cross feed of the machine is not used except to traverse the armature to the position where the cut will begin.

Approximate Formula for the Long Diameter of Hexagons

By A. R. Nottingham

The long diameter of a hexagon is one item of information that is often omitted from handbooks. When it is given, it is usually in round numbers, and one often wonders if this approximate value is close enough for the case in hand. When the figure is given accurately, it is invariably in decimals, and, if the result is desired in fractions (as is often the case in the drawing room or shop), the nearest even value must be selected.



Section of a hexagon

I have used a rule for years that has not been published as far as I know, and it seems worth passing on as being more convenient than tables, since it can readily be memorized. The short diameter of the hexagon is usually available or is chosen in design. Hence, to find the long diameter, add to the short diameter, or the diameter of the inscribed circle, one sixty-fourth of an inch for each tenth of an inch of the short diameter. This formula gives the results in a fraction of the nearest sixty-fourth of an inch, and any other approximations used are apparent. Algebraically the formula is expressed as follows:

$$D = d + (10d \times \tfrac{1}{64}) \text{ or } D = \tfrac{37}{32}d$$

where D equals the long diameter, and d, the short diameter. For example: a ½-in. hexagon has a short diameter of 5 tenths of an inch (0.5), and hence the long diameter would be:

$$\tfrac{1}{2} + (5 \times \tfrac{1}{64}) = \tfrac{37}{64} \text{ in.}$$

If the short diameter were ¾ in. or 7½ tenths, the long diameter would be based on 8 tenths instead, or

$$\tfrac{3}{4} + (8 \times \tfrac{1}{64}) = \tfrac{7}{8} \text{ in.}$$

This latter figure is an approximation, of course. In using any rule or empirical formula, one must keep in mind the degree of accuracy. This rule gives results that are slightly large, but the difference is negligible for ordinary work. The result is a sixty-fourth of an inch too large for a short diameter of 10 in. This error is about one-sixth of one per cent.

The exact value can be computed as follows: From the figure

$$\text{or } \left| \begin{array}{l} r = R \cos 30° \\ D = d \sec 30° \\ \quad = 1.1547\, d \end{array} \right|$$

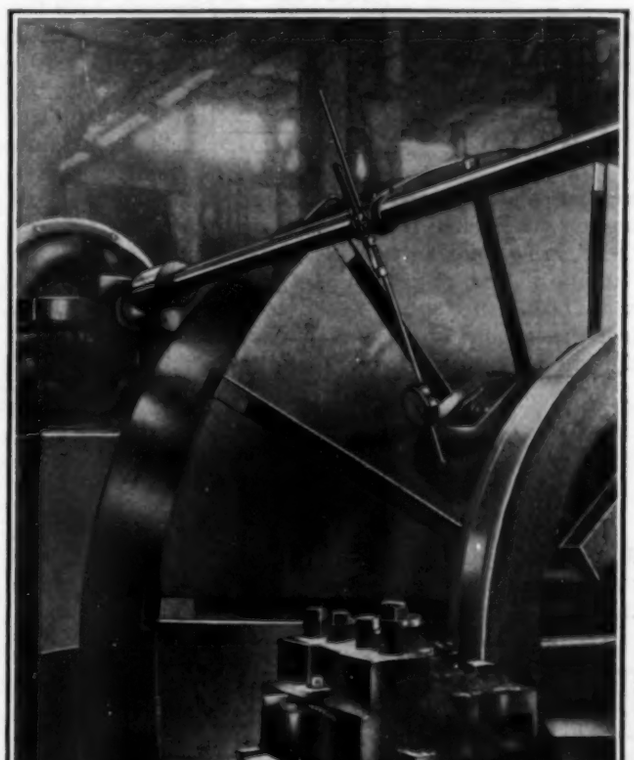
With the formula given: $D = \frac{37}{32}d = 1.15625\,d$, a figure that is large by 0.0016, but which is satisfactory for practical work.

Indicator Checks Size of Locomotive Tires

By L. L. Locke

In turning locomotive tires, it is essential to have them all of the same diameter. In the illustration is shown an indicator attachment seen recently in the Great Northern shops at St. Paul, Minn., applied to a Niles-Bement-Pond wheel lathe.

The device consists of a cross bar supported on the headstocks by two brackets, one in which the bar is fastened permanently and the other in which the bar is permitted to slide so as to permit adjustments of the heads. The indicator is mounted on the bar by a sliding clamp so that it can be moved lengthwise of the bar and locked in any position. There are two radial positions in which the indicator may be locked on the bar, one that holds it out of contact with the tire and another that brings the plunger in a radial line with the center of the wheel. Another adjustment permits the indicator to be moved to accommodate various diameters. For this adjustment, notches on the supporting rod make possible a rapid setting of the indicator for



Indicator arranged on lathe to check tire sizes

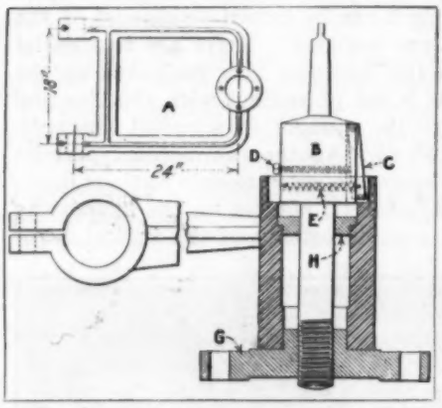
any size required within the range of the machine. One revolution of the pointer is equal to ½ in. movement of the plunger. The dial graduations are marked in ⅓₂ in., and between the divisions there are additional marks that make a reading of 0.002 in. possible. In operation, a cut is started on each tire after which the indicator is set to one tire, and then moved to the opposite tire so that a comparative reading can be noted. The graduated collars on the tool slides are then set to offset any difference that may exist. Considerable time is saved by the attachment.

Chasing Threads on a Drill Press

By Robert R. Durfield, Jr.

We had twelve yokes, such as shown at *A*, to bore and thread. Since we did not have a lathe large enough for the job, we did the boring in a milling machine, while the threading was done in a drill press.

For the threading, we made the tool shown in the illustration. The body *B* has a taper shank at the top to fit the machine spindle, and a lead screw at the bottom, of the same pitch as the threads to be chased. The center of the body has a lengthwise slot to accommodate the clapper *C* in which the tool bit is held. The screw *D* takes care of feeding the tool to the cut, and the spring *E* keeps the clapper against the screw. When the screw is released, the tool will be brought back far enough to clear the work.



Tool for chasing internal threads

The plate *G*, attached to the drill-press table, acted both as a locating plate for the work and as a nut for the lead screw. The collar *H* was used to support bar as near the cutting point as possible.

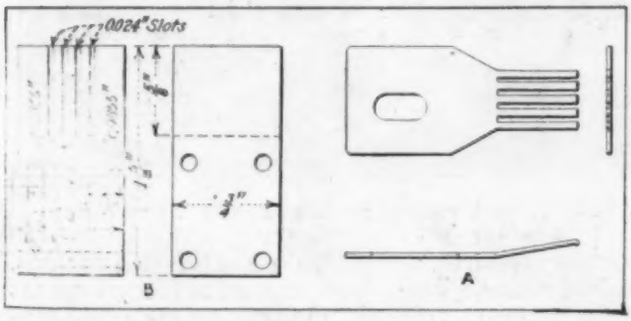
While the swinging action of the clapper changed the angle at which the tool was presented to the work, the tool was ground so that when the threads were cut to the full depth, they would be normal to the axis.

A Guide for Thin Saws

By J. E. Abbazia

The job of sawing four slits 0.023 in. wide by $\frac{3}{8}$ in. deep in the piece shown at *A* in the illustration was successfully accomplished by using the guide *B* to keep the saws from running in the cut.

The guide is made of four pieces of steel, hardened



A slitting guide

and step-ground to the shape here shown, the pieces being held together by four pins driven through and riveted in holes that were drilled and countersunk in them before hardening. The height of the shoulder made by grinding is 0.024-in., thus leaving 0.001 in. clearance for the saws.

Four saws 0.023 in. thick were ganged on an arbor with $\frac{1}{16}$-in. spacing washers between them. Twelve of the pieces to be sawed were clamped, with the guide, in the milling-machine vise and the saws passed through them, being guided by the fingers of this device. We had tried to saw the pieces without the guide, but had not been successful, since the saws would run and would not leave the prongs parallel.

Slits as narrow as 0.010 in. can be cut satisfactorily with a guide of this type.

Cutter and Fixture for Reseating Emergency-Valves

By George Feltner

In Fig. 1, is shown a cutter and a fixture for reseating emergency valves where the seats have become uneven or flat through wear. The tool rounds the edge of the seat, keeping it concentric with the outside

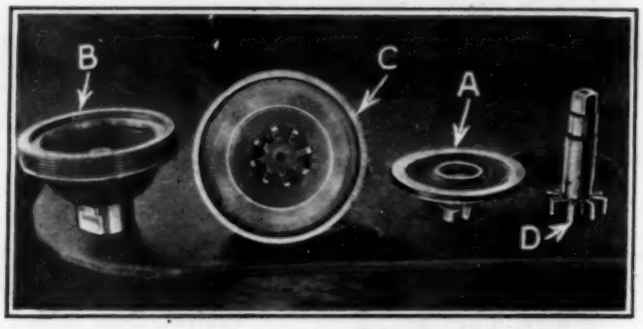


Fig. 1—The cutter and the fixture

where is fits the valve case. The work shown at *A* fits into the holder *B*. The cover *C*, containing the cutter, is screwed to the holder. The cutter is at *D*. In Fig. 2 is shown an assembly view of the unit with the work fitting over the locating plug *E* and in the recess *H*. The inner face of the cover strikes the upper surface of the work and holds it rigidly in place. The threaded end of the cover is provided with a knurled feed-nut that fits over the shank of the cutter. To operate the tool, the work is placed in the holder and the cover is screwed down. Then the feed-nut is adjusted until the cutter strikes the work. The cutter is revolved by a wrench and the nut is turned slightly, causing the cutter to feed into the work. Only a few turns are required to reface the valve seat. After a light cut has been taken, the work is examined to see if it has cleaned up.

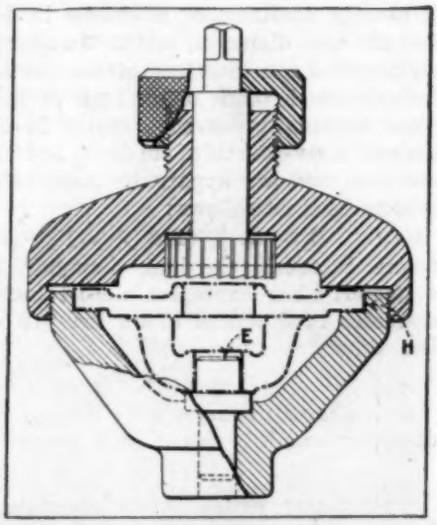


Fig. 2—Details of fixture and cutting tool

Metal Working Industries' Activity

Increased Activity During September

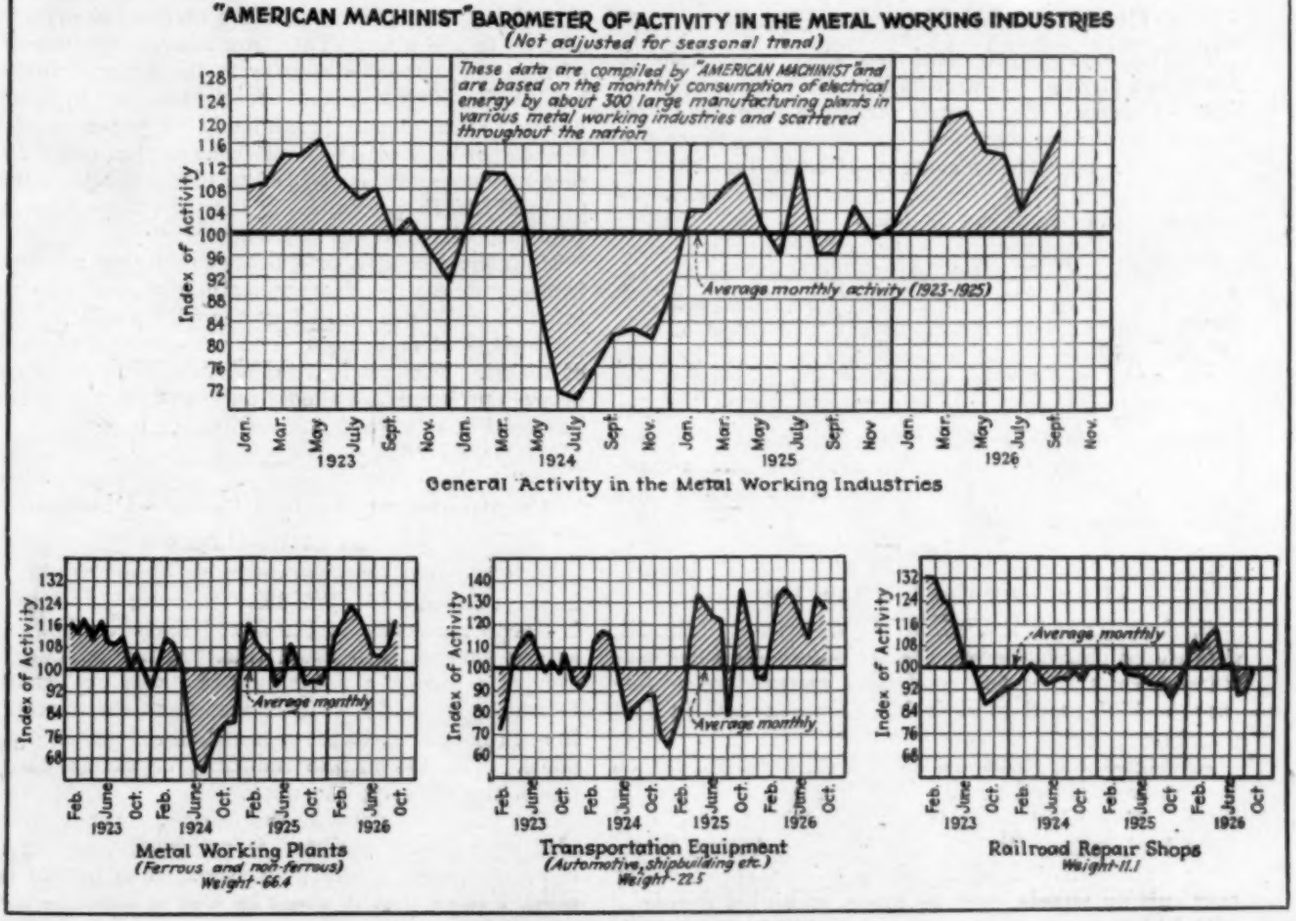
An increased rate of activity was apparent in the metal working plants of the nation during the month of September. The industry has been operating since the opening of the year at a rate above the average for the past three years. The peak of activities was reached in March, then a gradually decreasing rate of activity continued until August, when an upward swing was reported, the latter continuing through September.

In September the metal working industry was operating at 18.2 per cent above the monthly average for the past three years. This continued high rate of activity in the metal working industry, and in industry as a whole, has exceeded the forecasts made at the opening of the year, but to date no really unfavorable factors have appeared. The operations for the remaining months of the year should continue high, but will probably be below those of September. These are the indications of the trend of industrial activities based upon the monthly consumption of electrical energy as reported to the *Electrical World* by leading industries.

The actual production activity in the metal working industry during September was 6.3 per cent higher than that of August, the same companies reporting an electrical energy consumption during September of 103,415,000 kw.-hr. as compared with 97,300,000 kw.-hr. during August. The September reports indicate that operations in the metal working industry continued to exceed those reported for other primary industries of the nation taken as a whole.

September activities in the metal fabricating plants of the country were only slightly below those reported for March and April, the two peak months of the year. The low point in operation of these plants was reported during July, followed by an upward turn which extended through September. The September operations were 9.5 per cent higher than those of August, and 24 per cent higher than the activity reported for September of last year.

The automotive plants, which have been reporting record operations throughout the year, appear to have reached the point where a decrease of operations may be expected, the September operations being about 2.5 per cent less than those of August. Operations, however, were still 29 per cent higher than those of September of last year. Indications are that the railroad repair shops were operating at a rate 9.3 per cent higher than August.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Index of Activity
Average monthly activity (1923-1925)
1923
1924
1925
1926
General Activity in the Metal Working Industries
Average monthly
Metal Working Plants
(Ferrous and non-ferrous)
Weight-66.4
Transportation Equipment
(Automotive, shipbuilding etc.)
Weight-22.5
Railroad Repair Shops
Weight-11.1

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Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Lubricant for Ball Bearings

Q. What is the best oil to employ for ball bearings? The bearings which we are going to use are located on a 2-in. shaft that will rotate at a speed of approximately 1,500 r.p.m. The shaft is a main driving shaft on a fairly heavy machine.

A. The first requisite of a lubricant for a ball bearing is an oil or grease that will protect the highly polished surfaces of the balls and raceways, while at the same time reducing to a minimum the friction between the balls and the ball container.

A lubricant that is chemically neutral should be employed; that is, one that contains little or no free acid or alkali. The specification usually given is a maximum of 0.10 per cent of acid or alkaline substances. In your case a medium oil of this specification should answer the purpose. Tap off the bearing with a pipe or with a glass gage so that the depth of oil in the bearing can be controlled. The oil should be deep enough to cover the lower ball.

Generator for Magnetic Chucks

Q. We have a fair-sized job shop using electric power and buying our current from the local power and light company. We recently acquired two magnetic chucks for planers, but find that we are unable to use them on the alternating current which is furnished in the locality. We are anxious to use these chucks. Is there any way that it can be done?

A. You cannot use the chucks with the present electric installation. The two chucks probably do not require more than 500 watts when operating both together, and a small direct-current generator of one kilowatt capacity would be ample for carrying the load, and could be driven from any point of your shop shafting. Small generators of this type generally do not require rheostats or additional equipment, and are simple and inexpensive installations. You should experience no difficulty in having a local electrical dealer make this installation for you.

Choosing the Cutting Tool

Q. On page 564, Vol. 65, of the American Machinist, *it is stated that better results are obtainable when machining brass if carbon steel tools are used in preference to high-speed steel tools. Can you explain just why this is so?*

A. High-speed steels are softer than hardened carbon tool steels, and tools made from the latter will retain their cutting edge better than tools of high-speed steel when kept cool. Carbon steel tools are better, therefore, for the cutting of all metals at slow speed, or for easy cutting metals, such as brass, at higher speeds.

But high-speed steel has the property of retaining its degree of hardness even when red hot, whereas the carbon steel tool will lose its hardness as soon as it becomes heated. High-speed steel is thus better for high-speed cutting of hard or tough metals. For all metal cutting where the tool is not likely to be overheated carbon steel tools should be employed.

Composition of Manganese Bronze

Q. Can you recommend a proper mixture for a manganese bronze?

A. The term "manganese bronze" is so general that it is not possible to designate a definite composition without knowing the ultimate use of the material. The original manganese bronze was specified to contain about 90 per cent of copper, about 10 per cent of tin, and 0.5 to 1.5 per cent of ferro-manganese. But some of the manganese bronzes now produced contain as high as 40 per cent of zinc with little or no tin, and only 0.25 per cent of manganese. Such an alloy is in reality a brass, rather than a bronze.

One of the reasons for using zinc instead of tin is that the former permits the use of a small percentage of iron in the alloy. This iron adds to the properties of the alloy, but when used with tin it forms intensely hard spots in the metal. A commercial "manganese bronze" containing approximately 57 per cent of copper, 40 per cent of zinc, 1 per cent of iron and 0.25 per cent of manganese is claimed to give a tensile strength up to 85,000 lb. per sq.in. It is used for machine parts requiring strength and toughness.

Manganese bronze, or a brass containing manganese, is also quite distinct from manganese copper, which contains above 90 per cent of copper with a relatively high percentage of manganese, and sometimes a percentage of nickel. The possibilities of variations in alloys of bronze and brass are almost unlimited, and so far little has been done toward standardization.

Corrosion on Welded Parts—Discussion

BY S. W. MILLER

It is possible that the difficulty experienced by the inquirer on page 564, Vol. 65, of the *American Machinist* is due to the action of the flux, but thorough washing, as you suggest, will avoid this. In my opinion, however, the use of a reducing flame will not avoid the formation of oxide, which comes from the exposure of the red hot metal to the air, and not from the welding flame. The use of the reducing, or excess acetylene flame, also slows up the work.

The union obtained by the use of cast iron is molecular even though the steel is not melted, and as there is some danger of cracking steels when bronze is applied, I think that it would be well to continue the use of cast iron.

Technical Abstracts

Aluminum Paint—A Heat Saver

Aluminum paint performs the seeming paradox of keeping structures hot or cold. The use of a bright metallic coat of aluminum paint on oil tanks in order to reflect the sun's rays and keep the oil cool is by now a common sight and practice. It is, however, not as commonly known that aluminum paint can be used on the outside of a furnace in order to help keep it hot. Of two laboratory furnaces, one painted with black and the other with aluminum paint, the black one showed a surface temperature of 334 deg. F. while the other showed 435 deg. F. The difference was due to the greater radiating capacity of the black paint. For such high temperature work the aluminum paint must be specially made to get good results. Rather thin gloss oil varnishes are used for vehicles in these paints.—Junius D. Edwards, in *Chemical and Metallurgical Engineering*, Sept., 1926, p. 551.

Guarding Against Fire

Some employees, although up-to-date in other customs, still persist in carrying the old fashioned and dangerous common match, creating a fire hazard of no small degree. Not only the company property is imperiled by the carrying of this match, but the workman's own clothes and skin are liable to a costly, not to mention embarrassing, scorching.

Many fires have been started through the careless dropping of a match. Last year the fire toll reached more than a billion dollars. Most of this tremendous loss was due to carelessness in just such little things as carrying common matches, throwing oil rags into corners, and dropping lighted cigarettes. The workman can do his part in safeguarding the factory by carrying safety matches.—*Yellow Truck and Coach Factory News*, Sept., 1926, p. 8.

Lightning Protection for Oil Tanks

Oil is frequently stored in very large quantities, with tanks sometimes as great as 500 ft. in diameter. Between the roof and the surface of the oil there is an air space which may contain oil vapors. The mixture of air and oil gases may be in the right proportion to be explosive by a very small spark, and lightning sparks can occur in oil tanks from a direct stroke, from electrostatic induction, or from electromagnetic induction.

Direct strokes take place when the storm is overhead, but induced sparks can occur from storms at a considerable distance. Sparks can occur in metal tanks between plates making poor electrical contact, or from wires or pipes brought in from the outside and not making good contact with the tank.

All-metal tanks offer the only complete protection in oil storage against both direct strokes and induced lightning voltages. The thickness of metal must be great enough to prevent melting through. All parts of the tank must be in good contact, and a well bonded metal roof is more effective than a grounded roof net. Pointed rods should also be placed around the tank, three rods being sufficient for a round tank.—F. W. Peck, Jr., in *Electrical World*, Sept. 18, p. 572.

Temperature Stresses in Diesel Engine Cylinders

Stresses set up by the extreme changes in temperature occurring in the cylinder of a Diesel engine during the combustion cycle materially affect the design of the parts involved. In an effort to determine exactly what these stresses are, one cylinder of a 4-cylinder, two-stroke cycle Sulzer marine Diesel was set up on the test block at the Winterthur Works. Thermo-couples were introduced at critical points and a photographic recording apparatus was used to take the readings in the meter. The maximum temperature recorded in the cylinder head was 568 deg. F., in the cylinder liner, 630 deg. F., in the piston head, 541 deg. F. The temperature stresses in this engine fluctuated between 1,700 and 2,800 lb. per sq.in. at full load.—*Power*, Sept. 21, 1926, p. 438.

Cold Pressing of Metal

Copper slugs were cold pressed in a series of steps until they reached one fifth of their original height. The elastic limit was apparent at 44,000 lb. per sq.in. Thereafter the pressure necessary to deform the metal increased after each successive step until the outer edges began to fail. At this point the unit pressure was about 80,000 lb. per sq.in. The rise is accounted for by the increase in hardness of the metal, which varied from Scelerescope No. 73 to No. 93. Due to the introduction of tensile stress in the outer annular sections of the disk, there is a pyramiding of the pressure toward the center of the disk. This effect is quite noticeable in some cases, and it results in a greater thickness at the center of the disk than at the edges due to yield of the die steel.

Round steel slugs showed similar tendencies. A 0.12-carbon steel slug was compressed to half its height, and the pressure rose in a straight line from about 45,000 to 74,000 lb. per sq.in. with appreciable increase in hardness. In each case, the dies were flat pieces of metal, and the slug was free to expand laterally. These figures do not agree with Unwin, who set the "pressure of fluidity" for copper at 54,000 lb. per sq.in. and for mild steel at 112,000 lb. per sq.in. However, it is difficult to give a definite value for an abstract case.—E. V. Crane in *Mechanical Engineering*, September, 1926, p. 899.

Hurricane Destruction in Florida

First details of the effects of the Florida hurricane on engineering structures are contained in a despatch from F. E. Schmitt who was sent to Miami two days after the catastrophe. Well-carpentered small houses generally withstood the wind successfully as did all of the steel-frame buildings, except two. Sky signs, Spanish tile roofs, parapets, projections of all kinds, loose roofs, suffered early and very generally. Some loose I-beams were blown from an upper story of a high building under construction. A steel and a brick stack of the Florida Power and Light Co. were broken off but the company's group of gas holders weathered the storm. Some small plaster cracks are to be seen in one or two of the tall steel-frame buildings. No cracks have been found in reinforced concrete buildings. Much of the damage was caused by flying missiles.—*Engineering News-Record*, Sept. 30, p. 554.

Gear Blanks Made Centrifugally

Centrifugal casting of gear blanks was described by F. W. Rowe, Huddersfield, England, at a meeting of the Institute of Metals, at Liége, Belgium, in September, 1926.

The mold is of steel, with flat bottom plate to which the top half is held by cams, and the metal is poured into a central orifice in the top half. A cone clutch and gearing, operated by a variable-speed motor, drive a vertical shaft to which the bottom plate is bolted.

A hollow core forms the interior of the blank. It is set in a print in the bottom plate. The metal is poured into the central orifice in the mold, and flows into the center of the core, from which it is flung out to the walls of the mold through runners cut in the core.

A special refractory material is used for the cores to prevent bursting at high pressures and speeds. Speeds vary from 450 to 950 r.p.m., being selected to give a minimum pressure of 45 lb. on the walls of the mold. Pouring is not begun until after full speed has been attained.

The temperature of casting varies from 1,230 to 1,320 deg. C., according to the size of the wheel. High temperatures are used to secure long periods of solidification to insure full automatic feeding of the metal by centrifugal force, an advantage of the process. Molds are coated with a thin layer of refractory material mixed with carbonaceous material to prevent sticking.—*Iron Age*, Sept. 30, 1926, p 926.

American Machinist

KENNETH H. CONDIT AND FRED H. COLVIN
Editors

Established 1877

The Five-Day Week in Industry

THERE may come a time when the five-day week of work will be universal but that time has not come as yet. Certain well-equipped shops could probably turn out enough production in five days to make the sixth day's production superfluous, but they are exceptions. When it comes to the unionized trades where limitation of individual output is still common practice, a five-day week is economically unsound.

What should ultimately control the work-period is balance of production requirements against work requirements, with universal employment. Nor must our standards of living be lowered, or even held static; it is characteristic of our people that they must rise.

The question of the work period is an economic one. Before adopting a five-day week we should have the evidence that is now lacking. It will not do for a little group of men to say to our army of workers, "We must have a five-day week." Nor will it do for the army itself to come to that conclusion and demand its execution suddenly. First it must be shown that we are prepared to forego one-sixth of our production in the five-day week; or that developments in discovery and management will make up for the production loss.

Industrial history, however, shows a constant reduction in working hours. Our standards of production of one day are woefully slow the next. All of us remember the resistance to the abolition of the 12-hour day in the steel industry, and we know that we are better off without it.

The Ford experiment will be watched with interest by employers and employees alike. Should it prove successful there may be reason to extend its application but before this happens it will be well to study carefully all of the factors bearing upon the Ford case because some of them certainly will not be present in other shops and industries.

European Steel Cartel Not a Menace

EFFECTS of the cartel recently formed among European steel makers are not likely to be detrimental to sales by American manufacturers. The policies of the combination are not yet known, but apparently the purpose is to increase prices to the point where they will stabilize the business, which will help rather than hurt our foreign trade.

It is hardly conceivable that prices will be raised to the point where they will fail to stimulate consumption; and of course, if they should be, American steel will be given a price advantage. Too great a reduction in prices will mean a price war with American and British producers, and the new cartel will hardly make such a move.

The cartel will no doubt be managed by steel men, a point in its favor because privately controlled combines have the advantage of better management than those in government hands.

Buying as Needed

MANUFACTURERS of small tools, hardware, and supplies of various kinds, complain that most of their sales are now in small lots instead of large quantities, as was the case a few years ago. The answer, in part at least, is that railroad shipments have improved to such an extent that material can now be secured in less time and with greater reliability than ever.

Some manufacturers of the products named contend that they must now carry a much larger supply than before, which adds to their overhead. By the same token the total amount of capital formerly tied up in scattered industrial inventories surely must have been considerably more than is now required at the makers' plants. So there must be a net gain in the total amount of idle capital tied up in inventories, which is an economic advantage.

When Builders and Users Get Together

THAT closer co-operation, between the users and the builders of machines, is growing more and more necessary was shown by the discussions at the last production meeting of the S.A.E. in Chicago. The cost of delay in production was clearly shown and proved that good design and workmanship were of far more importance than a few dollars on the price of a machine.

Lubrication, as has been pointed out on previous occasions, is the greatest single factor in machine operation. Fault exists both in not providing for adequate and certain lubrication and in not utilizing the means already provided. One is due to lack of care in design—the other to lack of control of the man who operates the machines. In other words, to the system of management employed in the shop.

With a full realization that both the builder and user have a mutual interest in the success of a machine and that the best of machines must fail unless they receive the proper care, there should be little difficulty in getting together on an amicable and equitable basis. It takes such conferences as the one mentioned to get these problems out into the open.

Shop Equipment News

Keller Duplex Cam Grinding Machine

The Keller Mechanical Engineering Corporation, 70 Washington St., Brooklyn, N. Y., has developed the duplex cam grinding machine shown in the accompanying illustrations. The machine is intended to grind the hardened surfaces of cams of both the barrel and the flat types. It is a modification of the weight-controlled die-sinking machine made by this company.

In Fig. 1 the machine is shown grinding a barrel cam. At *A* the swinging arm that carries the grinding wheel is shown. This arm is carried on pivots on a saddle which is, in turn, carried on a horizontal slide, so that the wheel is capable of adjustment horizontally all the way across the work table *B*. By means of weight *C*, the arm is held against the work, either toward or away from the table, governed by the point of attachment to the bar of the chain carrying this weight.

Four rotating spindles are located on the work table, and their positions are adjustable vertically. Two of the spindles are horizontal and are for use with barrel cams. The other two spindles have vertical axes and are for use with disk or edge cams. In either case the top fixture always carries the master cam, or in the case of the edge cam, the template, which is the same size and contour as the cam to be ground.

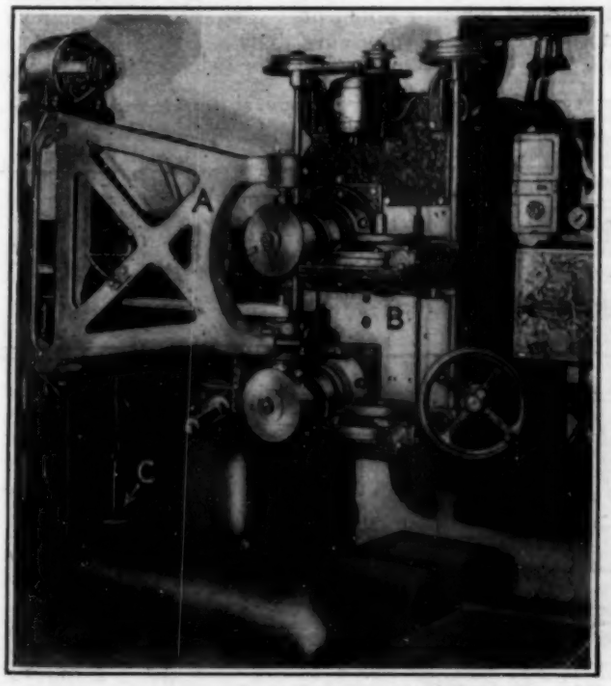


Fig. 1—Keller Duplex Cam Grinding Machine

In finishing barrel cams, the track is ground on one side at a time, being governed by the position of the weight *C*. Where the roller follower is to operate on a swinging arm, it is possible to grind barrel cams to the correct side angle of track. This modification is accomplished by means of a double pivoting of the swing arm, supplemented by a guide plate. A guide pin on the tracer end of the arm engages in the guide plate a slot, which is the same radius as the arm upon which the cam roller is to operate. The second pivot point in the arm *A* is released so that the radius of the swing arm no longer controls the travel of the tracer, which is now guided by the radius of the slot in the guide plate.

In Fig. 2 the machine is shown in operation on a disk cam. The tracer or guide is shown at *D*. This tracer is free to rotate upon its spindle and is slightly tapered, the largest diameter being the same or slightly larger than the diameter of the grinding wheel. The tracer spindle and the grinding wheel spindle are in line axially, so that when the tracer at its largest diameter comes in contact with the cam template, the grinding wheel will take a small cut on the cam. As in the case of the barrel cam, the grinding wheel is held against the work by means of a weight, and the tracer *D* bearing on the cam template moves the swinging arm in and out in conformity with the template shape, thus grinding the cam. If it is found necessary to remove more material in order to take out a rough spot, this operation can be done by raising the entire tracer by means of an adjusting screw and thus bringing a part of the tracer of smaller diameter in contact with the template. As a result, the grinding wheel takes an additional cut, as its diameter remains unchanged.

The four rotating work spindles are driven from a single motor by means of belts and gearing. Each pair of work spindles are worm driven from the same shaft, and the entire mechanism is mounted upon the work table. The motor for the grinding wheel, on the other hand, is mounted upon and moves with the swinging arm.

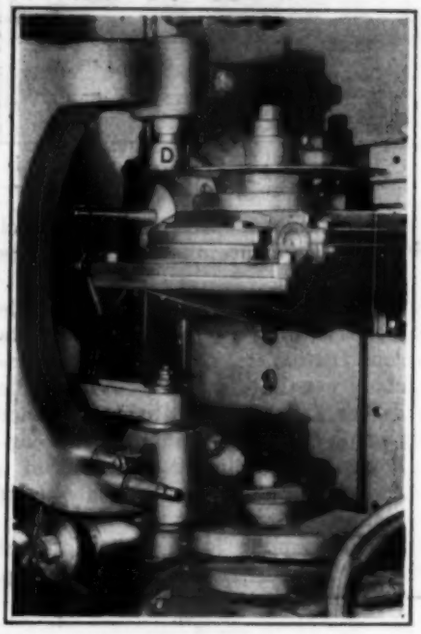


Fig. 2—Machine grinding a disk cam

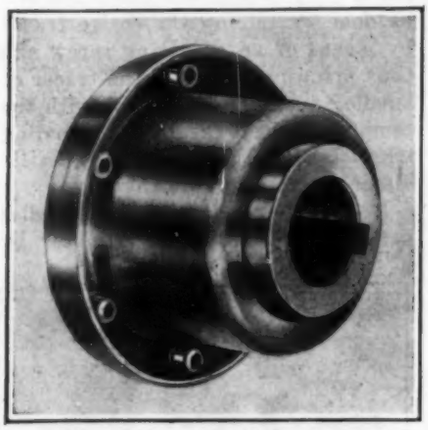
Falk Flexible Coupling

The Falk Corporation, Milwaukee, Wis., is marketing the flexible coupling illustrated. The coupling is said to prevent damage from all ordinary misalignment, and its torsional resiliency safeguards the driving unit

Shop Equipment News

from any destructive vibration of the driven machine.

The coupling consists of two flanged steel disks that are keyed to the respective shafts of the driver and driven units, the connecting pieces, and a steel shell, which incloses the whole and protects the coupling from dirt and at the same time retains the lubricant. The connecting pieces are tempered steel spring segments that fit into slots in the disk.



Falk Flexible Coupling

It is said that the coupling is made within very close limits. Its construction is such that the machine can be disconnected from the driver without disturbing either machine. Alignment of the couplings is accomplished by means of a short straight edge and a set of feelers.

The coupling is made in standard sizes ranging from ¼ to 30,000 hp. at 100 rev. per minute.

National Draftsman's Pen-Filling Ink Stand

The draftsman's pen-filling ink stand illustrated is being marketed by The National Tool Engineering Co., P. O. Box 712, Indianapolis, Ind. The device is made of gray iron castings, painted on the inside as well as on the outside with "Duco Ivory." The bowl is one piece with the body of the casting, and it is large enough to hold the contents of the standard 25-cent bottle of drawing ink. It is not necessary to use the bottle itself.

In order to keep the bowl tighly closed, the top has a soft rubber pad that fits snugly onto a machined surface on top of the bowl. The top is heavy enough to keep this joint tight, and when swung all the way back it will stay open so that a writing pen can be dipped in the bowl without interference. Instead of the customary quill for filling the ruling pen, a standard pen point that fits into a standard Eagle penholder No. 1040 is used. This pen point can be replaced when it becomes corroded.

It is said that the Duco finish reflects the light onto the filler pen so that the draftsman can apply the ruling pen quickly and accurately without getting ink on the outside of it. The filler pen raises about ¾ in. above the top of the bowl. The pivot pins on the cover are made of brass, and it is said that the workmanship and finish on the device are high grade. The weight of the unit is about 3 lb., so that it is not likely that the stand will be tipped over on the drawing board by a careless movement of the draftsman.

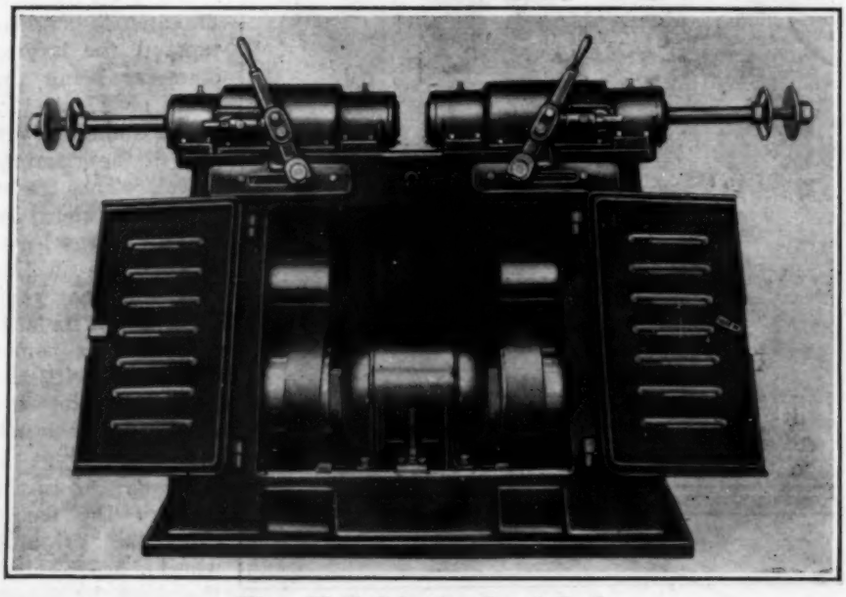
National Draftman's Pen-Filling Ink Stand

Hisey-Wolf Selective-Speed Buffer

The selective speed buffer shown in the accompanying illustration is being marketed by the Hisey-Wolf Machine Co., Cincinnati, Ohio. A rear view of the machine is shown with the doors open, revealing the method of drive.

Each spindle is driven by a separate motor pulley and it is possible to stop either spindle independent of the other by means of belt shifters at the rear of both spindles. An adjustable brake works in unison with the shifter and engages when the belt is shifted on the loose pulley. In this way the spindle is held stationary until the belt is again shifted. The belt tension can be regulated by means of adjusting levers at either end of the machine. Further adjustment can be obtained from the motor which is mounted on a hinged platform equipped with screw adjustment.

Ball bearings, twelve in all, are used throughout and are provided with suitable means of lubrication. A full automatic motor starter with push-button control is standard equipment. The standard spindle speeds are 1,600 and 2,000 r.p.m., but speeds of 2,400, 2,600 or 3,000 r.p.m.



Hisey-Wolf Selective-Speed Buffer

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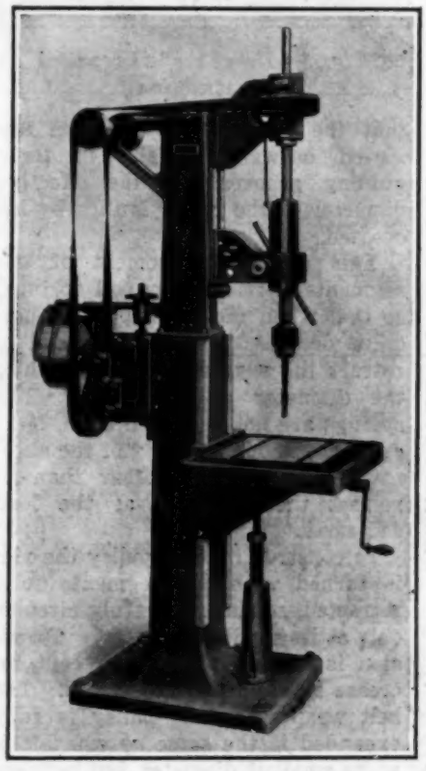
can also be furnished. If desired, spindles can be provided with a different speed on either end. The machine is made in three sizes with 7½,- 10- and 15-hp. motors.

Berghausen Sensitive Drilling Machine, Ball-Bearing

The ball-bearing sensitive drilling machine illustrated is being marketed by the Berghausen Machine Co., 2128 Colerain Ave., Cincinnati, Ohio. It will accommodate drills up to ¾ in. in diameter and has nine spindle speeds ranging from 250 to 2,100 r.p.m. Fafnir ball bearings are used throughout except on the loose pulley, which rotates on a bronze bushing.

The tight-and-loose driving pulley



Berghausen Sensitive Drilling Machine, Ball-Bearing

and the gear box are in a single unit slideably mounted in guides on the rear of the column. By means of a screw and handle wheel, the position of the gear box can be adjusted to tighten or loosen either the driving or the spindle belt. The driving pulley is 9 in. in diameter and its rated speed is 665 r.p.m. to obtain the stated spindle speeds. Two levers are provided to shift the steel gears, and two alphabetical plates indicate the positions of the levers for each spindle speed.

The drill table can be raised or lowered by means of a telescope screw, the handle for which is shown at the front of the table. The finished table top measures 13½ x 14 in., and two ⅝-in. T-slots are available for holding fixtures, etc. A total vertical adjustment of 22 in. can be had.

The spindle sleeve is made of cast iron and is ground. A forged steel rack is fastened to it for engaging a pinion that is actuated by a handle, the length of which is adjustable according to the size of drill used. This sleeve is counter-balanced by a weight inside the column. The spindle itself is a ground steel forging, ¾ in. in diameter, provided with a No. 2 Morse Taper. Its maximum distance from the table is 30 in., made possible by a vertical movement of the head of 7 inches.

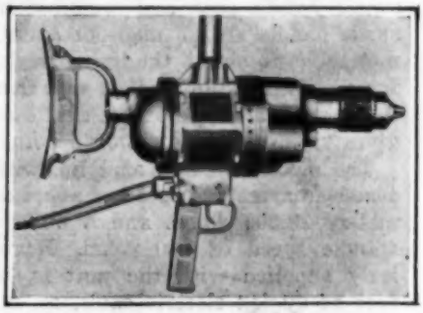
The spindle pulley bracket has a tongue, which engages a groove in the column, and is held in place by two cap screws. The pulley is centralized between the bearings, which are split to facilitate scraping. The spindle slides through the pulley and is driven by means of a feather key.

The base of the drill measures 20x24 in. The machine weighs 635 pounds.

Black & Decker Portable Electric Drill, ⅝-In.

The ⅝-in. portable electric drill shown in the accompanying illustration is being marketed by the Black & Decker Manufacturing Co., Towson, Md. It is designed so that it can satisfactorily use either carbon or high-speed steel bits to drill holes up to ⅝ in. in diameter in steel or up to 2 in. in diameter in wood. The unit can also be used with spring-expanded cylinder hones or positive-set hones.

The motor contained in this unit is of the universal type, wound with special characteristics for this class of service. Norma open-type ball bearings are used on the armature shaft. The outer races are fitted into steel inserts cast integral with the aluminum field case and gear cover, which form the housings for the motor. With a steel insert a good bearing for the outer race of the ball bearing is obtained, since it has been found that bearings tend to pound out if mounted directly in aluminum. Bearing adjustment is accomplished by means of a helical spring fastened to a plate which bears against the outer race of the



Black & Decker Portable Electric Drill, ⅝-In.

ball bearing. Both motor bearings are packed with a proper grade of grease, which is held around the bearings by means of suitable seals at both the commutator and armature ends.

The motor is provided with carbon brushes, which are carried in die-cast brush holders which, in turn, are mounted on a fiber ring held to the field case by means of screws. This ring need not be disturbed when the brushes are removed.

Ventilation of the motor is accomplished by means of an aluminum fan mounted upon the armature shaft. The air is drawn through slots in the commutator end cover, passes around the armature and field coils, and is exhausted through holes in the field case adjoining the gear case.

All gears are of spur gear design and are made of high-grade carbon steel heat-treated. They are pressed on and keyed to ground steel shafts. The armature pinion is mounted on a slight taper so as to insure a positive seat. Three gear trains are used to give the desired reduction in speed and the necessary high torque at the drill.

Bearings for the intermediate gear shaft and the spindle itself are made of special phosphor-bronze of suitable length and diameter to give long wear and life to the unit. The thrust of the drill is taken on a ball

Shop Equipment News

thrust bearing packed in grease. It has a separate compartment provided for it. The spindle carries a standard three-jaw geared chuck mounted on a slight taper. This company's patented chuck key holder is provided in the handle and breast plate.

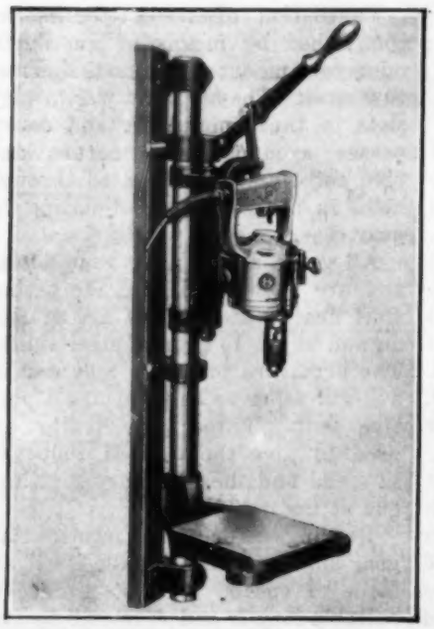
The gear case, gear-case cover, field case, commutator end cover, switch handle case, and combination spade handle are all made of aluminum so as to obtain the light weight for ease in handling. It is said that the hexagonal shape of the field case gives rigidity to the motor housing.

The motor is rated at ¼ hp. with a no-load armature speed of approximately 13,500 r.p.m. and a no-load spindle speed of 400 r.p.m. Regularly supplied with the unit is 15 feet of duplex electric cable, an attachment plug, and detachable side handles. The unit weighs 17½ pounds.

"United States" Drill Wall Bracket, Type Q

The type Q drill wall bracket illustrated is being marketed by the United States Electrical Tool Co., Cincinnati, Ohio. It is designed for attachment to the wall where bench space is limited.

The bracket is designed to take care of the ¼- and ⅜-in. portable electric drills made by this company. The vise-like grip mechanism eliminates the use of special adapters. The drill may be raised or lowered or swung around on the vertical column. It is secured in any desired position by adjustment of the clamping screws. The drill is supported by an inclosed spring. It is said that the bracket is made of heavy material and with careful workmanship.



"United States" Drill Wall Bracket, Type Q

Sleeper & Hartley Expansible Pulley

The expansible pulley illustrated, made by Sleeper & Hartley, Inc., Worcester, Mass., possesses the property of increasing its diameter automatically as the load upon it is increased, thus slowing down the rotative speed of the machine of which it is the driven member in proportion to the amount of work imposed upon it. It is particularly adapted to wire-drawing and similar machinery, for which it is especially designed, but may be applied to other machines for which an automatically variable speed is desired.

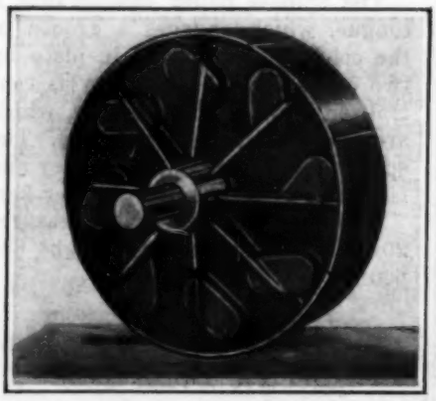


Fig. 1—Sleeper & Hartley Expansible Pulley

The pulley consists of a disk, with a hub that is to be keyed to the driven shaft, having in the face of the disk a series of pockets that are inclined at an angle to the radius in the direction the pulley is to run; a similar disk, with hub to fit the shaft, in which are an equal number of radial grooves of rectangular section; and eight (or more, according to the diameter of the pulley) rim segments, to each of which is integrally attached an arm, or spoke, fitted to slide in the radial grooves of the second disk.

Upon each of the arms there is a horizontally projecting stud to which is fitted a hardened steel roller, so that when the pulley is assembled upon the shaft it is to drive there will be a roller engaged with each of the inclined pockets of the first disk. Forward motion of the pulley resisted by the shaft, thus causes each roller to travel up the incline of its respective pocket, with the result that the segments of the rim are moved outward radially in their guiding grooves and the effective diameter of the pulley is thereby increased.

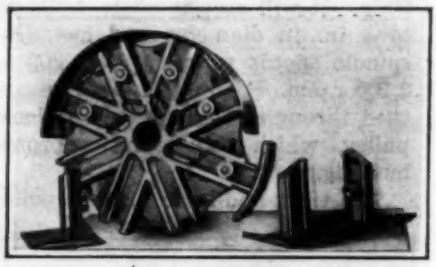


Fig. 2—Details of the pulley construction

This outward movement of the segments is resisted by coil springs, so that when the load upon the machine decreases the springs tend to retract the segments and so reduce the diameter of the pulley. The springs are not depended upon, however, to provide any part of the automatic speed control other than to retract the segments as the load decreases.

In constructing the pulley the rim is turned with the segments fully retracted, so that it is truly circular only at its smallest diameter. Provision is made for a 20 per cent increase in diameter under load. The belt wrap when the pulley is fully expanded is the same as when it is at its smallest diameter, but between adjacent segments there will be a short length of the belt that lies tangent to the circle and unsupported, though not detracting from the available pulling power. It is necessary to use a weighted or a spring-suspended idler upon the belt.

The pulley is shown assembled upon a short shaft in Fig. 1, and in Fig. 2 with the first, or guide, disk removed, some of the segments are displaced to show the construction.

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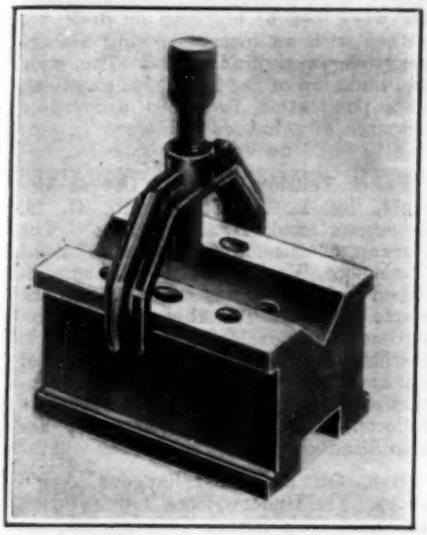
Brown & Sharpe "Handy" Block and Clamp, No. 751

The block and clamp shown in the accompanying illustration has been placed on the market by the Brown



Brown & Sharpe "Handy" Block and Clamp

& Sharpe Manufacturing Co., Providence, R. I. The "Handy" block is intended for many uses in the garage, shop, or home, and can be used as a V-block and clamp, anvil, or vise.

The block has a capacity for round stock up to 1 in. in diameter, and for flat stock up to ¾ x 1¼ in. The block measures 3 x 1¾ x 2 in. The Handy block and clamp is used for holding pieces while being milled, ground, or drilled, for straightening twisted pieces, or for centering round pieces. It is accurately machined and case-hardened.

Kelly Driving-Box and Car-Wheel Boring Tools—Erratum

Some errors that appeared in an article on equipment made by the Kelly Reamer Co., Cleveland, Ohio, under the above title on page 613, Vol. 65, of the *American Machinist* should be pointed out. In the second paragraph of the original article, the statement was made that three blades are used in all block units. Actually, the driving-box boring bar is the only tool that has three blades, and the adjustable block units that are used for roughing cuts are of two-bladed construction. In the driving-box boring bar, the three-bladed construction, used for the finishing cut, is set slightly behind the roughing blades and at a right angle to the block unit cutter. This last blade is adjustable independent of the block unit and is placed in a slot in the bar at a right angle to the slot of the adjustable unit.

The last paragraph of the article is correct in reference to the lower tool shown in Fig. 2. The tool shown in the top of the figure, however, is the adjustable block-unit type of car-wheel boring tool, and, by means of three sets of blocks, the full range of boring can be obtained. The tool shown in the lower part of Fig. 2, on the other hand, has the adjustment and blades built into the bar, and two bars are required to cover the full range of car-wheel bore sizes.

Atkins "Silver Steel" Hacksaw Blade

The E. C. Atkins & Co., Indianapolis, Ind., is placing on the market a "silver steel" hand hacksaw blade with similar properties to its silver steel power blade.

The silver-steel blades are claimed to cut from 28 to 50 per cent faster than the same size blades of other steels, and to give six times as much service. The blades are made in all of the standard pitches.

Trade Catalogs

Air Filter. The American Blower Co., Detroit, Mich., has published bulletin No. 2223 on its air filters. A complete discussion of the theory and application of the device is given. The bulletin contains twelve, 8½x11-in. pages and is profusely illustrated by means of photographs, line cuts, and charts.

Grinding Machine, "Size-Matic," Internal. The Heald Machine Co., Worcester, Mass., has published bulletin No. 528 on its "Size-Matic" automatic internal grinding machine, style No. 72. A complete technical description is given of the construction and operation of this grinding machine. The function of each and every part is explained, with the aid of photographs. In fact, over fifty halftones are used to illustrate the bulletin, which contains forty, 8½x11-in. pages. Complete specifications are given, and numerous examples of work that has been performed on this machine are presented.

Grinding Wheels. The Abrasive Co., Bridesburg, Philadelphia, Pa., has issued a small leaflet on its "S-Elastic" bakelite-bonded grinding wheels.

Heating, The "Venturafin" Method of. The American Blower Co., Detroit, Mich., has issued bulletin No. 5618 on its so-called "Venturafin" method of heating. The Venturafin unit is for heating factories, warehouses, garages, stores and auditoriums. It consists of a set of finned steam coil pipes, together with a suitable fan and air duct for drawing cold air from a point near the floor and discharging it through the coils at the upper end of the unit. The theory and design of the unit is explained and numerous examples of typical applications are given. Complete specification and capacities and dimensions are also presented. The bulletin contains sixteen, 8½x11-in. pages and is well illustrated by means of halftones and line cuts.

Hoisting and Conveying Equipment. The Wright Manufacturing Co., Lisbon, Ohio, has published catalog No. 11 on its chain hoists, trolleys, and hand cranes. The various types of Wright ball-bearing type high-speed hoists are first described and illustrated. Screw hoists and differential hoists are then discussed. Information on trolleys, chain wheels, and other accessories then follows. A technical section is devoted to chain, hooks, clearances, and dimensional information for the various size hoists, including complete specifications for each unit. The bulletin contains seventy-two 8½x11-in. pages and is well illustrated.

Milling Machines. The Ingersoll Milling Machine Co., Rockford, Ill., has published a bulletin on its adjustable-rail milling machines. More than half the space is occupied by illustrations showing various views of the machines, some of them in actual operation on typical jobs.

Roller Bearings. The Hyatt Roller Bearing Co., Newark, N. J., has published General Engineering Bulletin No. 1560 on its roller bearings for industrial equipment. The bulletin contains sixty-eight 8½ x 11-in. pages bound in paper covers in loose-leaf form. Information is first given on the material requirements and the construction of Hyatt roller bearings. An explanation of the various types of bearings and their proper selection follows. The determination of bearing size is then discussed, including the effect on the capacity of speed, shaft hardness, nature of the service, and whether the shaft is rotating or stationary. Tables of basic capacities and dimensions then follow for bearings of four different types. The formulas frequently used in computation of bearing loads are also given.

In discussing housing design, alignment, retention of bearing parts in operating position, lubrication and ex-

clusion of foreign matter, endwise location of the shaft, and the lateral stability of wheels and pulleys are taken up. Suggestions for the care and maintenance of these bearings are given. The remainder of the bulletin, over half of the total, confines itself to the application of these bearings to such equipment as railroad rolling stock, steel mills, electric motors, mine cars, contractor's equipment, textile machinery, lumbering equipment, paper machinery, woodworking machinery, leather machinery and lineshaft work. A large number of line cuts and half tones are used to illustrate the text. The treatment is entirely technical in character, and the bulletin compares very favorably with other engineering manuals put out by ball and roller bearing companies in the past year.

Rolls, Straightening, Forming and Bending. Kane & Roach, Syracuse, N. Y., has published a general catalog on its equipment. The catalog consists of a series of bulletins bound in a folder of forty-four, 8½x11-in. pages. Bulletins Nos. 51 to 59 are devoted to straightening rolls, while bulletins Nos. 71 to 74 describe bending rolls. Bulletins Nos. 91 and 100 are devoted to cold roll-forming machines and special machinery. Each bulletin contains two photographs of the machine and a short technical description. The rest of the catalog consists of photographs showing typical installations of these machines. In fact, the entire catalog is largely pictorial in presentation.

Sheet Metal Working Machines. The Niagara Machine & Tool Works, Buffalo, N. Y., has issued booklet No. 105 on its machines and tools for sheet metal working. The first part of the booklet, which contains forty, 4x5¾-in. pages, is devoted to power presses. Various types, such as inclinable-back, horn, punching, gap, and single- and double-crank power presses are listed. Power shears of both the squaring and circle types are next described. Brief descriptions of miscellaneous machines are appended. The booklet is well illustrated by means of many photographs.

Speed Reducers, Worm-Gear. The Horsburgh & Scott Co., 5110 Hamilton Ave., Cleveland, Ohio, has published several bulletins on its worm-gear speed reducing units. In each case the construction of the various units is explained and various design features are pointed out. The bulletins are all well illustrated.

Springs and Formed Wires. Wickwire Spencer Steel Co., 41 East 42d St., New York, N. Y., has published a technical treatise on springs that is outstanding in its line. The terms and customs of the spring industry are explained in the introduction. The rest of the booklet, which contains thirty-six, 8½x11-in. pages, is divided into numbered sections. In the first section, compression and extension springs are discussed in theory. Torsion springs, motor and clock springs, automobile, scroll, formed, flat, and agricultural-implement springs are discussed in turn, and the peculiarities of each type of service are pointed out. Section 10 deals with the theory and design of a spring, with the aid of charts and various formulas. Useful tables, such as a table of fractions, gages and decimals of the steel wire gage, a table of comparative sizes and difference between wire gages, a table of decimals, common fractions, and millimeters, and weights are included. An appendix deals with the theory of error calculations and its application to the helical spring formula for round wire. Practical examples of its use are given. The text is presented in a pleasing manner and several well chosen illustrations are included.

Pamphlets Received

Advertising, Co-operative. — The Policyholders' Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has issued report No. 89 under the above title. The aim of the booklet is to set forth a succinct review of the experience of some of the most successful users of co-operative advertising and to draw from this experience certain conclusions as to the uses and purpose of this type of advertising. Suggestions as to the organizing and conducting of such campaigns are also given. The booklet contains sixteen 8½x11-in. pages and is bound in paper covers.

Apprenticeship. Information and Experiences in the Development of Industrial Training. The Department of Manufacture, Chamber of Commerce of the United State, Washington, D. C., has issued a 52-page, 7x10-in. pamphlet dealing with the above subject. The booklet is compiled largely from authoritative sources. Suggestions for laying out a course in apprenticeship, supervision, methods of selling the apprenticeship idea, relation to shop training and vocational educations, and typical outstanding apprenticeship developments and activities are taken up in turn. Much statistical data are included in the appendix.

Axles, Shafts, and Other Forgings for Locomotives and Cars. Industrial Standards No. 12 issued by the Department of Commerce, Washington, D. C., and sold by the Superintendent of Documents, Government Printing Office, for 5 cents. This pamphlet contains standard specifications for quenched and tempered carbon-steel axles, shafts, and other forgings for locomotives and cars as adopted by the American Society for Testing Materials. The manufacture of the steel is described, and its chemical and physical properties and tests for same are given. The text is presented in both Spanish and English.

Clearing the Way for the Comforts of Life. This well-arranged and artistically decorated booklet traces the development of transportation in the United States from the early stage coach through the various forms of steam locomotion up to the new oil-electric locomotives, several of which are now in use on American railroads. Interesting figures showing the economy of the oil-electric locomotive are given toward the end of the text. It is published by the Ingersoll-Rand Co., 11 Broadway, New York.

Experience Is Master. The Cutter Co., Philadelphia, Pa., has published an 80-page booklet, bound in stiff board covers, under the above title. The booklet contains brief biographical sketches of all Cutter employees that have served the company for 10 years or more. Each write-up is accompanied by a photograph of the man at his work bench, machine or desk, together with an insert showing his appearance in civilian attire. The style and make-up of the booklet is excellent. This publication furnishes a splendid example of what can be done in this line to build up employee morale.

Fabric Tension Meter for Use on Aircraft, by L. B. Tuckerman, G. H. Keulegan, and H. N. Eaton. The Bureau of Standards, Department of Commerce, Washington, D. C., has published technologic paper No. 320 on the above subject. The theory of the instrument is developed in considerable mathematical detail and four cases of its application are given. A description of the instrument and its operation follows. Limitations in accuracy are also discussed.

Gas, Oil and Miscellaneous Appliances. The Underwriters' Laboratories, 207 East Ohio Street, Chicago, Ill., has published a list of inspected gas, oil, and miscellaneous appliances in the form of a 72-page, 6x9 in. pamphlet, completely indexed. Acetylene equipment, car-heating systems, cleaning machines, cork boards, discharge devices for hazardous liquids, electric lighting plants, electric motors for use in explosive atmospheres, films, floor brushes, fuel oil engines, furnaces and furnace appliances, garage heaters, gases and gas accessories such as engines, mixers, producers and the like, gasoline appliances, heaters of all kinds, hose, incubators and brooders, meters, oil burners, and accessories, refrigerating machines, tanks for hazardous liquids and tank accessories, gages, unions, valves and waste cans are listed in Section 1. Section 2 is devoted to liquids and materials classified as fire hazards. A correction sheet has been published for acetylene equipment, page 6.

Sieve Specifications. The Department of Commerce, Bureau of Standards, Washington, D. C., has published Technologic Paper No. 321, entitled "A Study of Sieve Specifications," by Lewis V. Judson. The pamphlet contains ten pages and is illustrated. The effect of wire diameter and size of openings on sieving performance is considered as well as the size of the sieve. The causes of rejection of sieves are discussed. Sieve-testing apparatus is described and revised specifications for sieves are given.

Why Steel Cracks. Stanley P. Rockwell Co., 66 Trumbull St., Hartford, Conn., has issued Bulletin No. 2609 under the above title. An explanation is made of the various strains set up in steel by uneven heating and quenching conditions.

News of the Week

Gear Manufacturers Continue to Make Progress by Development of Proposed Standards

Committee reports show satisfactory growth of interest in gearing problems—Revision of recommended practices accepted—President Frost's address—Abstracts of technical papers

ANOTHER marker in the progress of gear standardization was established by the fall meeting of the American Gear Manufacturers' Association, held at Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 14-16, with a registration of 75. The three days were devoted to committee reports and discussion of proposed standards, with technical and non-technical papers interspersed among the standardization activities.

Following the precedent established two years ago at Briarcliff, one evening was devoted to a technical standards meeting, at which the sub-committees formulated plans for intensive work to be carried on before the eleventh annual meeting, to be held during May, 1927, at Jackson, Mich. If the progress made following this technical standards meeting matches that made after the earlier Briarcliff meeting, the sessions to be held at Jackson will no doubt rival those of the Pittsburgh meeting of the spring of last year.

New Members

The Falk Corporation, of Milwaukee, and the Skoda Works, of Prague, Czecho-Slovakia, were elected to membership. No individual representatives have been named by the Falk Corporation. Joseph Kveton, the American representative, with headquarters in Detroit, will be executive representative of the Skoda Works.

Ira M. Short was elected an additional associate representative of the Westinghouse Electric and Manufacing Co., East Pittsburgh.

C. W. Manser was elected to replace Emile J. Guay, of the General Electric Co., West Lynn, Mass., who died July 17, 1926. H. D. Randall was elected associate representative to replace W. W. Miller, of the General Electric Company.

Although truly a hard-working organization, the American Gear Manufacturers' Association does not believe in all work and no play, and at each meeting sets aside a half day for recreation. At the Briarcliff meeting golf was the principal diversion. A. C. Woodward, vice-president of the A. & F. Brown Co., Elizabethport, N. J., won the *American Machinist* cup.

Progress reports were received from the Sprocket Committee, G. M. Bartlett, chairman; the Tooth Form Committee, H. J. Eberhardt, chairman; the Metallurgical Committee, C. B. Hamilton, Jr., chairman; the Non-Metallic Gearing Committee, F. G. Sorenson, chairman; the Committee on Gears and Pinions, Electric Railway, Mill and Mine, W. H. Phillips, chairman; the Spur Gear Committee, J. L. Williamson, chairman; and the Library Committee, E. J. Noble, chairman.

The nomenclature offered by the Transmission Committee, S. O. White, chairman, was adopted as proposed recommended practice. As given in the report, the wording is the same as that adopted by the Society of Automotive Engineers at the meeting in June of this year, and appearing in the latest edition of the S. A. E. Handbook.

Proposed recommended practice for automotive engine flywheel housings, submitted by the same committee, also was adopted. It relates to the flywheel housing dimensions for mounting unit-type transmissions to engines of the automotive type. These standards have already been adopted by the S. A. E. Data on flywheels, included in the S. A. E. standards, are omitted from the A.G.M.A. report as being out of the province of the association.

Revision of the recommended practice for herringbone gears, adopted April, 1923, was accepted as offered by A. F. Cooke, chairman. This revision includes correction of the factor Y to conform to the theory of the transmission of load at the pitch line instead of at the point of the tooth, as in the Lewis formula. Nomenclature also has been revised to conform to recommendations of the nomenclature committee.

Holes and Keyways

Minor alterations, offered by the special committee on holes, H. J. Eberhardt, chairman, were adopted. The recommended practice for holes had been adopted in October, 1919, and revised in October, 1926. The present alterations are mainly in the explanation of the standard and in the recommendations relating to inspectors' and operatives' gages. There is no change in the value of the "go" and "no go" limits.

Proposed recommended practice offered by R. B. Zerfey, chairman of the keyway committee for keyway sizes for square and flat keystock, was referred back to the committee for further consideration, especially to secure evidence to support its contention that the $\frac{1}{4}$-in. key is necessary.

"Suggested Standards for Future Design of Spur Gearing," offered by D. T. Hamilton, chairman of the nomenclature committee, were adopted. These standards provide symbols devised according to definite rules.

Satisfactory progress of the association, in its technical work and in its condition as an organization was shown by the reports of B. F. Waterman, chairman of the general standardization committee and the A.G.M.A. sectional committee of the American Engineering Standards Committee; T. W. Owen, secretary of the association; and C. F. Goedke, treasurer. E. W. Miller reported for the A.G.M.A. representatives on the A.S.M.E. Research Committee on Gears. Earle Buckingham reported on the present status of gear testing being conducted at the Massachusetts Institute of Technology.

Technical Papers

During the three-day session the following papers were read: "Do We Know Our Business?" by W. H. Diefendorf, of the Diefendorf Gear Corporation. "Conditions Governing the Use of Hypoid Gears," by F. E. McMullen, of the Gleason Works. "America—the Keeper of the Keys," by C. E. Stuart, president of the Central Alloy Steel Corporation. "Recent Devolopments in High-Speed Chain Drives," by George M. Bartlett, of the Diamond Chain and Manufacturing Company.

The meeting was called to order by the president, E. J. Frost, of the E. J. Frost Gear and Forge Co. In his address Mr. Frost touched briefly upon the history and accomplishments of the association since its formation at Lakewood, N. J., in March, 1917. At that time nine companies were represented, while today there are over ninety member companies. Pioneers in this effort included H. E. Eberhardt, F. T. Hamlin, Frank Horsburgh, B. F. Waterman, and Fred W. Sinram, past president and now honorary president.

The main accomplishments have been along the lines of technical standardization, although considerable progress has

been made in the commercial phases of the work of the Association. Much work was done toward standardizing methods of cost finding, although a great amount of opposition was encountered. Another object has been to eliminate a wide variety of designs.

Much valuable standardization work was done during the war, when the organization was first formed. Various committees went to Washington in order to have specifications made that called for a minimum of specialized equipment, and to eliminate refinements that no shop could possibly meet.

Mr. Frost expressed the opinion that profit ideals were not high enough, since not enough margin was allowed to take care of obsolescence of costly equipment, holdups and cancellations of orders, and research work.

Due thanks were given the members of the technical press, which has made the work of the Association so effective both in bringing information to persons who could not otherwise be reached, and also by molding opinion so that the various standards adopted were actually put into effect commercially.

Abstracts of some of the papers follow.

Conditions Governing the Use of Hypoid Gears

By F. E. McMullen
Gleason Works

Hypoid gears resemble spiral bevel gears in that they have curved teeth, but in the case of the Hypoid, the axes are offset and the pinion is much larger in diameter. The spiral angle of the gear is less, while the spiral angle of the pinion is equal to or larger than the corresponding spiral bevel gear. Their principal advantages are silent operation and strength.

Gear teeth in general, when case-hardened, become thicker and shorter with a resulting shortening of the profile bearing contact. With Hypoid gears it is possible to overcome this difficulty by cutting the tooth bearing slightly heavier at the top and bottom than at the pitch line so that an even weight of profile is obtained after hardening. The lengthwise bearing can also be controlled and all bias bearing eliminated.

Hypoid gears are intended primarily for automotive work where the large production will warrant the necessary development work; it is not economical to manufacture in small quantities. Nearly all rear axle gears are lapped to obtain smoothness, and this operation can be done efficiently on Hypoids because of the endwise sliding between tooth surfaces. With spiral bevel gears, it is possible to spoil a pair by excessive lapping, thus causing too great a confinement of the tooth action at the pitch line. The sliding motion of Hypoids, on the other hand, smooths the entire bearing surface of the profiles.

The reduction of the spiral angle on the gear results in a decreased normal tooth load for a given transmitted load, while the chief advantage of the enlarged pinion diameter is that a larger pinion shank is permitted. The added stiffness prevents concentration of the tooth load and permits the full utilization of a longer tooth bearing. In fact, for best operation the whole gear and bearing mounting should be designed with a view of minimum deflection, so that the pinion will not spring away from the gear. Adoption of the webless type of gear with suitable ribbing on the differential case and sufficient spread of the differential bearings will provide the necessary stiffness without much increase in cost.

The distance between bearings is important on the pinion shaft, particularly where an overhung pinion is used. This overhang should not be greater than one-third of the bearing center distance. Since the offset axes of Hypoid gears make the pinion overhang inherently larger than a similar spiral bevel set, the spacing of the bearings for the latter will not be sufficient for the former installation, and redesign is necessary.

Recent Developments in High Speed Chain Drives

By George M. Bartlett
Diamond Chain and Manufacturing Co.

The behavior of a chain drive of either the so-called silent, or inverted-tooth, type or the roller type is affected by such primary conditions as sprocket speed, horsepower, center distance, and number of teeth, and such secondary conditions as chain velocity, pull, length, angle of bend of links, weight of links, and projected area of rollers. Other influences are centrifugal force, friction, inertia and impact.

To illustrate some of these effects, let us assume that a sprocket has its tooth number changed from 12 to 24, the revolutions remaining the same. The pull then becomes only half as great and each link turns an angle half as great, although there are twice as many bends per minute. The chain length increases, considering that the center distance remains constant, and the wear is thus divided among more links; in fact, it is only four-elevenths as great in the latter case as in the former, and the life of the chain is multiplied by 2¾.

The wear on the chain pins has been found to be proportional to the angle of bend times the bends per min. times the chain pull, divided by the number of links in the chain, or, stated mathematically, $= \dfrac{\frac{360}{N} \times NS \times \frac{396{,}000H}{SNP}}{L} = \dfrac{C}{NPL}$

where N equals number of teeth, S equals r.p.m., H equals horsepower, P equals pitch, L equals chain length in pitches and C is a constant. The angle of bend is $\frac{360}{N}$ and the number of bends per min. equals $N \times S$. The chain pull equals $\frac{396{,}000H}{SNP}$. The life of the chain is, therefore, proportional to NPL or to the product of the number of teeth by the chain length in inches. Another effect of having a large number of teeth is that the pulsations in transmission are reduced, since the real pitch line of a sprocket is a polygon and not a circle, and as the number of teeth increases the polygon approaches more closely a circle.

It might appear that when the chain velocity is doubled, assuming constant r.p.m., the rollers must approach the sprocket with twice the velocity. However, the impact between the rollers and the spocket teeth does not take place in a direction parallel to the chain travel, but perpendicular to it. Hence, the velocity of impact is proportional to the angular velocity of the approaching link about its pin, which is in turn equal to the angular velocity of the sprocket itself, and is, therefore, independent of the number of teeth or of the chain velocity. It follows, therefore, that if the r.p.m. remains unchanged, an increase in chain velocity does not increase the impact between the chain roller and the sprocket teeth.

Under high lineal velocities there are three factors that may affect the correct action between the chain links and the sprocket teeth; inertia of the individual links, viscosity of the lubricant surrounding the pins, and centrifugal force. Because of the first two factors, the chain appears to resist the act of unwrapping, but this condition seems to have no ill effect upon the drive even at high chain velocity. The sprocket teeth have no part in this phenomenon, since the same thing occurs when the chain is simply wrapped around a smooth pulley. Centrifugal force is probably the only factor that produces a measurable effect on the action of the chain at high lineal velocities. A small amount of slack in the chain is usually desirable, but where the velocity is high centrifugal

Maximum Sprocket Speeds

Chain No.	Pitch, In.	Max. R.P.M.	Average Horsepower		
			Single	Double	Triple
30W	⅜	3,600	1.5	3	4.5
40W	½	2,600	2¼	4.5	6.75
50W	⅝	1,900	3½	7	10
60W	¾	1,500	5	10	15
80W	1	940	0	18	27
100W	1¼	645	13	26	39
120W	1½	520	19.5	39	58
140W	1¾	370	23.25	36.5	69.5
160W	2	325	31.5	63	94.5

force affects the correct action near the point where the pull is low and it is necessary to take up most of the slack in order to avoid the tendency of the rollers to "top the teeth."

While the lineal velocity of the chain has little effect upon its operation, the rotating speed of the sprocket is a determining factor, since it directly affects the impact between the chain and the sprocket. The velocity of impact is independent of the number of teeth, or of the angle of bend of the link, or of the chain velocity. Instead it depends directly upon the revolutions per minute of the sprocket and the pitch of the chain. The energy of impact between the roller and the sprocket is proportional to the weight of the chain link and to the square of the velocity of impact, while the destructive action between a roller and sprocket is proportional to the energy of impact divided by the projected area of the roller. The velocity of impact, on the other hand, is proportional to the r.p.m. of the sprocket and to the pitch of the chain. Stated mathematically, the destructive action is proportional to $\frac{MV^2}{A}$ or $\frac{MP^2S^2}{A}$ or $\frac{WP^2S^2}{A}$, where M equals weight of one link of chain (lb.) equals $\frac{WP}{12}$; W equals weight of chain per ft.; V equals velocity of impact (f.p.m.); A equals projected area of roller (sq.in.); P equals pitch (in.), and S equals r.p.m. of sprocket.

The maximum value that this expression for destructive action can take in average practice has been found from experience to be about 4,000,000. Equating the last expression to this number, we find that the maximum value of $S = \frac{2{,}000}{P}\sqrt{\frac{A}{WP}}$. From this formula, it is evident that in order to attain high sprocket speeds the pitch must be kept short, the weight of the chain low, and the roller area high. When this formula is applied to the standard series of roller chains, the maximum speeds shown in the accompanying table are obtained.

The sprocket speeds shown in the third column are the highest advisable speeds for any type of chain, whether roller or tooth type, and in actual practice the speeds are usually not more than 75 per cent of those given in the table.

Special Roller Chain

In order to use a short pitch chain for high speeds and at the same time transmit an appreciable load, it is necessary to provide a special type of roller chain designed for light weight, short pitch and large roller area. To do this it is only necessary to build up standard roller chains of short pitch in double, triple, and quadruple widths, and to give proper attention to accuracy and precision of manufacture of the chain parts, including uniform heat-treatment of the bearing surfaces. It is obvious that precision in this design is important because of the multiple width. With such chains it is possible to transmit two, three, and four times as much power at a given speed as was formerly the case, and it is also possible to transmit a given amount of power at three or four times the speed in r.p.m. as is possible with single-width standard chains.

Such chains operate much more quietly that chains of single width. Some chain drives are noisy because of the accoustic conditions connected with the installations, and some parts of the mounting may act as resonators. Furthermore, a chain, the links of which are built up laterally of a number of similar parts will run more quietly than when each link is practically a solid mass throughout its width.

America—The Keeper of the Keys

By C. E. Stuart

President, Central Alloy Steel Corporation

To be really great a nation should have commercial supremacy, political stability, and social order. America, the United States, possesses all three. Commercial supremacy has been attained because industry as a whole has worked and planned for individual opportunity with sufficient surplus to enjoy the luxuries of life in addition to the bare necessities. Low cost, not through low wages, but through improved methods and the elimination of waste, has resulted in general prosperity. Every conceivable necessity is being produced at a price within the purchasing power of even the humblest wage earner.

Industrial Fraternalism

Education in industry is another contributing factor and allied to it is the general education along the lines of "safety first." Group insurance and profit-sharing plans have also contributed to closer co-operation between employer and employee. Among manufacturers business fraternalism has replaced cut-throat competition, and associations such as the A.G.M.A. are linked up with wider groups, such as the National Association of Manufacturers to further one purpose—that industry may employ and produce for the benefit of all.

Compared with European countries, the United States has an enviable position politically. England is going through trying times, France struggles with finance, while Germany wishes it had a dictator like Mussolini instead of that nice old gentleman, Von Hindenburg. Europe still clings to the idea of placing power in the hands of the few, while in America business does not wait upon the coming of a political czar.

Our national social order finds its inception within our factories and institutions of business, under a system whereby opportunity and a liberal reward awaits those willing to make the effort. Our stability is threatened, however, by the demoralizing influence of the liquor interests, whereby an amendment to the Constitution is flagrantly violated and ignored by men holding positions of national prominence.

Commerce, War and Navy Unite on Air Program

The War Department has announced that an Advisory Air Co-ordination Committee is to be created, consisting of the assistant secretaries for aviation in the Department of Commerce, War and Navy, which shall recommend general policies relating to the air activities of the Government.

Creation of the committee it was explained was at the suggestion of Dwight F. Davis, Secretary of War. The announcement by the department follows in full:

"At the suggestion of the Secretary of War, Hon. Dwight F. Davis, there is to be created a committee to be known as the Advisory Air Co-ordination Committee, the membership of which shall be the Assistant Secretary of War (for aviation), the Assistant Secretary of Navy (for aviation), and the Assistant Secretary of Commerce (for aviation). The duty of this committee shall be to recommend to the Secretaries of War, Navy and Commerce, general policies relating to the co-ordination of the air activities of the Government."

In addition to the newly-formed committee, there are already in existence three other agencies for co-ordinating the air activities of the Government. These are: The National Advisory Committee for Aeronautics, which is composed largely of civilian technical experts of the Government; the Aeronautical Board, composed of three representatives from the Army and three from the Navy, headed by the Chief of the Army Air Corps and the Chief of the Naval Bureau of Aeronautics; and the Joint Army and Navy Board, which is composed of the Chief of Staff of the Army; the Deputy Chief of Staff of the Army; Assistant Chief of Staff, War Plans Division, General Staff of the Army; the Chief of Operations, of the Navy; the Assistant Chief of Operations of the Navy and the Director of the Planning Division of Naval Operations.

Report German Airplane Consolidation

Another large airplane construction company—the Udet Works in Munich, Bavaria, is said to have been taken over by the German federal government, according to advices to the Department of Commerce. Last spring the Udet plant amalgamated with the Rumpler Works in Augsburg, Bavaria, under the name of the "Bayerische Flugzeugwerke, A. G." In January last the Junkers Airplane Co. and the Aero Lloyd were amalgamated and it is understood the federal government acquired an interest in this company.

Connected with the Rumpler section of the new company is said to be Dr. Rumpler, who has been creating considerable talk in Germany lately by virtue of his model "plane of the future." This model portrays a giant ten-motor, three-tailed bus, with accommodations for 100 passengers which will be able to cross the ocean easily. The model is being shown in movie theaters all over Berlin.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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"WHERE do we go from here?" is the question that most American business men are now asking. The drop in the stock market and the severe decline in cotton has cooled the enthusiasm of the chronic optimists, and the idea that prices could go up uninterruptedly is not insisted upon as it was. But this is not to say that there is any widespread pessimism or any indication of a general contraction in business.

That the purchasing power of the cotton states will be curtailed is manifest, and bankers and merchants in that part of the country will have to be conservative. But trade elsewhere is still good and even if a general reaction impends it is unlikely that it will be felt until after Christmas.

Of this possibility all that can be said is that the farmers of the South and West are now in a mood that may enable them to act together in demanding that the government shall "do something" to relieve their distress. Just what that "something" ought to be no one seems to know, but the fact that a record cotton crop and the largest wheat crop in five years will bring less than it cost to produce them is one that has a sinister significance in a country that is still preponderantly agricultural.

All sorts of remedies are proposed, President Coolidge has appointed a committee to consider the subject, bankers and merchants associations all over the country are giving advice and passing resolutions, it has even been urged that a special session of Congress should be called, and it is plain that those who are in public life realize that the issue is one that contains much political dynamite.

To say that our farmers should produce less is futile. The record of the past has shown that agriculture is like a second marriage in that it is a continuous triumph of hope over experience, and even if a law limiting the acreage planted were passed it would probably be disregarded by most of the 6,500,000 farmers to whom it would apply.

View it as we may, the problem seems almost unsolvable and correspondingly dangerous. Therefore we may be sure that it will provide fuel that will keep the political pot boiling for some time to come.

It is, however, about the only unfavorable feature of major importance that is to be discerned in a situation that is otherwise placid. Cotton excepted, the commodity markets have been quiet. Coffee continues to slip down. If it had not been artificially supported for so long a reaction upward would be in order.

What's Doing in Industry

With the month two-thirds gone the sales volume in machinery and tools bids fair to equal that of September. Orders are scattered over a wide territory and among many industries, showing the general trend of manufacturing activity. These orders call mostly for replacements and the trend of the sales curve is upward.

The Mid-West continues its activity with automobile manufacturers the leading buyers. Detroit dealers report business on the upgrade. A greater volume of sales and inquiries in Cincinnati has renewed optimism in expectations for the closing months of the year. Chicago admits slight recession in sales but fresh inquiries show this to be only a temporary condition. Slight expansion is reported from Indianapolis.

Business in the East is brisk but the volume is not particularly large. Dealers in the New York market find plenty of replacement business in various lines of manufacture. In New England dealers and manufacturers find new business depends largely on the ability to make quick delivery. Canada reports sales good and inquiries from new construction enterprises encouraging.

The September figures issued by the National Machine Tool Builders' Association show the biggest volume of business since October, 1925. The September index number for all companies was 192.9 as against 164.2 for August. Orders exceeded shipments by an appreciable figure.

Sugar yielded slightly on Wall Street selling made necessary by the decline in the stock market, but the strength of the statistical situation is reasserting itself, and a refiner whose opinion carries much weight is predicting an advance to 3¼ cents in the near future.

Cotton goods, as well as woolens and silks, have been freely bought, the shoe trade and shoe factories say that business is better, and hides show a sympathetic improvement. The lumber mills are more fully employed, and reports from the steel industry are still cheerful but without enthusiasm, as the demand from the automobile industry shows some decline.

The lull in building activity may also have been reflected in the market for metals, as it was at a meeting of the United Real Estate Owners' Association of New York at which the chairman and the treasurer both predicted lower rents in the near future.

As well as one can see from this distance the situation in Europe is not unlike our own in its comparative placidity. Even the British coal strike seems to be settling itself as the miners return to work in small squads. Their action is regarded as a confession of defeat that leaves a bitter taste in the mouths of those who are compelled to accept it. But it is nevertheless reassuring to know that England will not perish from the cold during the coming winter and that she may ultimately recover some of the trade that she lost during the strike.

Another encouraging development in the British situation is the advance in ocean freight rates and the improvement in the shipping trade. For several years but little new tonnage has been added to the world's merchant fleets and the demand seems to have at last overtaken the supply. The need of vessels in which to ship coal from the United States to Europe and the growth in American trade with the Far East are the principal reasons for the highly gratifying change that has now become apparent.

Certainly the optimist can find much to justify his unwavering faith in the recuperative power of humanity as he compares present conditions with those that existed eight years ago, when less than a month before the armistice, Europe seemed to be an economic ruin.

The recovery that has taken place in the interval and the rapidity with which the world has been made over is an augury for the future that should embolden us as we face the peace time problems that are now giving some of us so much concern.

The Industrial Review

Progress of the machinery and machine tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

New England

Buying of machinery from builders in the New England territory during the past fortnight has, in many instances, been conditioned upon early delivery. Immediate shipment or assurance of prompt delivery has been specified and executives believe that these orders savor of urgent need. This, with the volume of inquiry mail, is construed as forecasting a continuation of the prevailing activity in the industry for many months.

There has been a representative amount of buying for continental European countries, with the demand largely for production machines. Domestic buying has contained a noticeable representation of the automotive industry, with rail equipment companies also prominent. Small tools are in good demand.

Steel manufacturers and selling representatives of Mid-Western companies working in this immediate territory report there is an increasing volume of business in this immediate territory. Nowhere is there any indication of any slowing up of the industry.

New York

Machinery and machine tool business in this market has slackened off somewhat during the past ten days. New leads are scarce, but there is plenty of business hanging fire which should close before the end of the month.

It is the opinion of many dealers and agents in this locality that large buyers have practically used up their machinery appropriations for this year, and that henceforth there will be nothing but replacement business from these lucrative sources. In fact, the orders received now call mostly for single machines to be used as replacements. No large lists are reported at present.

An idea of the scope of present business may be had from the following list of buyers of machine shop equipment in the past week: Delco Light, Commonwealth Brass, Baird Machine Co., National Cash Register, Hartford Machine Screw Co., Inland Steel, International Harvester, Western Electric, Illinois Steel, New York Central R.R., Illinois Central R.R. and the General Electric Co. None of these placed large orders, most requirements being for single pieces of standard equipment.

Canada

Fall buying in the metal markets is reported as good from all parts of Canada. Sales for the last quarter are brisk, with some inquiries out for the first few months of 1927. The general healthy condition of industry and the favorable movement of such decisive factors as railroad earnings and building commitments are imparting confidence to the markets.

It is understood that considerable new business from one of the railroad companies is pending, and an announcement is expected soon. Work will be commenced shortly on a $15,000,000 warehouse for the Montreal Rail and Harbor Terminals Co. The Dominion Bridge Co. has secured the steel contract for the Royal Bank of Montreal.

The outlook for the British Empire Steel Corporation is reported to be the brightest in years.

The announcement was made a few days ago that the governments of Ontario and Quebec, had signed a contract with the National Hydro Co. for the development of the Carillon rapids on the Ottawa River. It is expected this project will involve an expenditure of approximately $40,000,000 and about 270,000 hp. of electric energy will be developed.

Cincinnati

Machine tool manufacturers in the Cincinnati district express the opinion that the sales-curve has by no means reached its high-point, and the common prediction is that sales will continue to increase for another two months, if not longer.

A greater volume of business was done by manufacturers in the past week than in the preceding week and a greater number of inquiries were received. Selling agencies also did more business than in the previous week. Orders booked contained a few lists, but the great majority of the purchases were single tools and replacements.

The feature of the week was the large buying of the Delco company which made what is said to be the largest single purchase of the year, calling for large and small tools to the amount of a million dollars or more. While all of this was not bought in the Cincinnati market, local concerns got their share.

Other than this, the sales made during the week were well scattered over all sections of the country, the purchases being made by concerns in various lines. Concerns in the automotive industries bought rather freely, sending in some lists, but the majority of the orders called for single tools.

Railroad purchases were not heavy, but numerous inquiries came from this source. There was an increased number of orders from general machinists, as well as inquiries.

Indianapolis

Slight expansion is reported in both machine tool and machinery business here. While there has been some expansion in the total volume done as compared with the same period last year, there is spottiness in various industries. These weak spots in demand, however, are expected to strengthen. Much is expected from the automobile industry in Indiana this winter. Indications now point to a record production by virtually all the factories. This naturally will mean increased tooling demands. Already there are tangible results to be noticed. Orders are a little better and the volume of inquiry is reported to be stronger.

Another profitable market at the present time is the farm implement industry. From Evansville and South Bend, where most of the larger implement factories are located, come numerous inquiries. Factory executives say their factories will make heavier stocks for late winter distribution than were made up last year. In both the automobile field and the farm implement field, it is believed that most of the buying will be for replacement purposes.

Generally speaking, the railroad demand is not as heavy as had been hoped for. There has been a little gain during the last two weeks, but the volume is not large. A good demand continues for special coal mining machinery, and for special woodworking machinery for the furniture factories and lumber factories.

Chicago

No material change in the machine tool market from that reported a week ago is noted. There has perhaps been a slight falling off in the volume of business transacted, as compared with the latter part of September, but such decrease has mainly been felt by dealers in used tools. New tools of standard make are in moderate demand, and manufacturers' representatives are looking forward to increased activity as soon as the closing of lists now in circulation starts. Of these, the requirements of the Illinois Steel Co., which consist of 40 or more tools for the company's Gary plant, is most discussed. A smaller list, issued by the Pullman Car and Manufacturing Co., will, it is believed, soon be closed. A few other of the big industrial concerns are in the market for single tools or small lots.

The automotive industry is preparing to enter the market for equipment, one of the larger manufacturers having already bought a number of tools and given indication of additional requirements to be filled later. Thus far, October has proved to be somewhat of a disappointment in the matter of actual sales, but there are those in the machinery business who are optimistic that the month, as a whole, will average up with September. Inquiries resulting from the recent machine tool exposition are still being received.

Detroit

Business reported by some of the leading machinery and machine tool dealers in Detroit is on the up-grade and the peak of the curve of sales in this city and in other automobile centers in Michigan will not be reached for some weeks.

Sales are largely for replacements in the automotive plants, with most orders confined to single tools. But the demand for such equipment is rather wide-spread and all dealers are reporting a fair volume of business.

Sizeable lists of new equipment are being prepared by the engineering departments of several of the larger manufacturers, and before many weeks have passed it is expected that much of the antiquated machinery now used in some of Detroit's automobile plants will be replaced.

A tendency noted of late is the determination of engineers to have new machines which can be used for more than one purpose. Special machines are in demand in certain quarters, but standard equipment adaptable to more than a solitary use is in high favor.

Railroads are buying some stuff, but no large orders have come through during the past week.

An encouraging feature is the manner in which small machine shops have found their business picking up and this has had a favorable reaction on the machine tool industry.

Extensive Plans Ready for Management Week

Unusual interest is being shown all over the country in Management Week, which will be observed Oct. 25 to 30. Plans are under way in at least thirty-five states for the observance of the week, and almost without exception the great industrial centers will have programs of interest to the engineers and business men of these centers.

At a meeting of the National Committee on Management Week held at the Engineers' Club in New York on Sept. 24, it was reported that definite programs covering one or more days have been perfected in about a hundred cities, while one hundred and five other cities expect to have programs worked out very soon. The national committee is taking steps to bring about meetings in certain cities where interest has not yet crystallized, and to assist other local groups which are having difficulty in working out satisfactory programs.

The extent to which various service organizations are getting behind the movement this year is most gratifying. In addition to The American Society of Mechanical Engineers, the American Management Association, the American Institute of Accountants, the Society of Industrial Engineers, the Taylor Society, and the Department of Commerce, which are the organizations sponsoring National Management Week, such well-known groups as the United States Chamber of Commerce, Rotary International, the International Lions Club and the Civitans are joining hands in putting it across.

Administration, producton, and selling have all made great improvements since 1921 and the Hoover report has had no small part in this. The general disseminating of tried and proven practices since 1921 has been strongly promoted by Management Weeks.

In New York all the participating interests have been grouped into five general classes: namely, Banking; Railroads; Management; Industry at Large, and Retailing. The Metropolitan Meeting on Oct. 26 will not only include addresses by the most representative authorities in each group, but will also include introductory and general addresses by industrialists of international repute. Thirty-three well-known organizations in this district are co-operating in the activities.

Question Sale of Surplus Liberty Motors

Whether or not the War Department should put on the market its surplus of 12,000 Liberty motors is open to question, Secretary Hoover points out. If new airplanes are equipped with the latest motors it stimulates their manufacture and helps get the industry into quantity production which soon will make it possible to reduce prices.

The War Department motors must be altered before they can be used most effectively. There has been a decided advance in engines since those the War Department has declared surplus were built. As a result $1,000 has to be spent in alterations on each motor to bring it up to date. The Liberty motors that have been sold have averaged $2,000 each. An entirely new motor embodying the latest refinements costs $5,000. The question is whether the airplane manufacturers can afford to pay $2,000 for an old motor and then spend $1,000 more to improve it.

The President has given assurances that the War Department surplus will be handled in such a way as not to hurt an industry which it is so important to build up.

E. A. Sperry Awarded Fritz Medal

The John Fritz Gold Medal for 1927 has been awarded to Elmer Ambrose Sperry, of New York, for the development of the gyro-compass and the application of the gyroscope to the stabilization of ships and aeroplanes. This annual award was made unanimously by the board of sixteen representatives of the American societies of Civil, Mining and Metallurgical, Mechanical and Electrical engineers, having an aggregate membership of 56,000. The medal is awarded not oftener than once a year for notable scientific or industrial achievement, without restriction on account of nationality or sex. It is a memorial to John Fritz, late of Bethlehem, Pa., long a leader in the American iron and steel industry. A few of the other medalists are Lord Kelvin, George Westinghouse, Alexander Graham Bell, Charles T. Porter, Alfred Noble, James Douglas and Henry M. Howe.

The presentation of the medal will take place on Tuesday evening, Dec. 7, in the Engineers Club, 29 West 39th St., New York, in connection with the annual meeting of the American Society of Mechanical Engineers. At this session President William L. Abbott, of the society, will deliver the annual address, and Charles M. Schwab, president-elect, will be inaugurated. The medal will be presented by Frank B. Jewett, Ph.D., chairman of the board which made the award.

Obituaries

H. H. BASSETT, president and general manager of the Buick Motor Co., and vice-president of General Motors, died of double bronchial pneumonia at the American Hospital at Neuilly, France, on Oct 17. Mr. Bassett had been attending the International Automobile Salon in Paris. Mr. Bassett was a native of Utica, N. Y., and had been associated with the manufacturing industry for many years. He was at one time vice-president and general manager of the Weston-Mott Co. He joined the General Motors organization as assistant general manager of the Buick unit in 1916. He was a prominent member of the Society of Automotive Engineers.

A. A. DION, general manager of the Ottawa Electric Co. and the Ottawa Gas Co., died at his home in Ottawa, Ontario, on Oct. 8, in his 67th year. Mr. Dion was one of Canada's most prominent electrical engineers. For years he had enjoyed prominence and membership in the National Electric Light Association, the Engineering Institute of Canada, and was fellow of the American Institute of Electrical Engineers, the Illuminating Engineering Society and the American Metric Association.

Personals

LELAND BROOKS has been appointed special representative at Chicago for the Worthington Pump and Machinery Co.

OSCAR W. NILSON, formerly of the Frew Machine Co., of Philadelphia, is now associated with the Noiseless Typewriter Co.

JOHN A. NEEDY has been appointed Dean of the College of Engineering, Ohio Northern University, Ada, Ohio.

KENNETH FELIX has joined the sales force of the Rome Wire Co., of Rome, N. Y. He was formerly associated with the National Metal Molding Co.

NORMAN C. CHAMBERS, formerly associated with the Niles-Bement-Pond Co., is now representing the Chicago Pneumatic Tool Co. in Russia.

H. E. STREETER has been appointed manager of the New York office of the Landis Tool Co. This office has been removed to 149 Broadway.

M. J. ULRICH has been appointed Detroit representative for the coated abrasive division of the Carborundum Co., of Niagara Falls, N. Y.

FREDERICK H. CHAPIN has been elected president of the National Acme Co., of Cleveland. Mr. Chapin was formerly vice-president of the Bourne-Fuller Co., manufacturer of steel products.

WILLIAM J. MASSEY, formerly plant engineer for the Chevrolet Motor Co., has been appointed chief engineer and superintendent of the new Statler Hotel and office building in Boston.

GEORGE E. AKERSON has been appointed assistant to Secretary of Commerce Herbert Hoover. Mr. Akerson has been Washington correspondent of the *Minneapolis Tribune*.

JOHN MCGEORGE, formerly chief engineer for the Wellman-Seaver-Morgan Co., has been appointed manager of the oven and conveyor engineering department of the McCann-Harrison Corporation, of Cleveland.

J. M. ALLEN has joined the factory organization of the Foote Bros. Gear and Machine Co., of Chicago. He will be in charge of production activities. He was formerly associated with the Goldsmith Metal Lath Co., of Cincinnati.

GORDON H. MCCRAE, London, England, vice-president of the Independent Pneumatic Tool Co., is making a business visit at the home office in Chicago and factory at Aurora, Ill. Mr. McCrae is in charge of the London office of the company.

GEORGE BOEHNER has joined the sales organization of the American Hammered Piston Ring Co., of Towson, Md., and will have as his territory Minnesota and North and South Dakota. Mr. Boehner's headquarters will be at Minneapolis.

PROFESSOR JAMES A. HALL, of the mechanical engineering department of Brown University, has become associated in a consulting capacity with the Brown & Sharpe Manufacturing Co., of Providence, R. I. Professor Hall will continue his work at the University.

EDWARD H. CHENEY has been appointed sales manager of the Wagner Electric Corporation at St. Louis, succeeding Thomas T. Richards, who resigned. Mr. Cheney has been with the Wagner corporation since 1905, when he became Chicago office manager. In 1909 he was promoted to Chicago district manager, in which position he served until his present appointment as sales manager.

VERNON C. WARD, of Chicago, has been made manager of the new junior beam department of the Jones & Laughlin Steel Corporation, of Pittsburgh. Mr. Ward for the past 17 years has been contracting engineer for the American Bridge Co. in Chicago and has a long experience in the marketing of structural material and steel products.

Business Items

The National Aluminum Manufacturing Co., of Indianapolis, has opened a plant at 210 East St. Clair St., in that city.

The Silent Hoist Winch and Crane Co. announces the removal of its factory and general offices to its new building at 762 Henry St., Brooklyn, N. Y.

The Commercial Tool Co., of Cleveland, has been appointed distributor in that district for Jarvis tapping attachments, manufactured by the Charles L. Jarvis Co., Gildersleeve, Conn.

The New England Butt Co., Providence, R. I., builder of braiding machinery and wire rope machinery, has opened an office at 140 South Dearborn St., Chicago, Ill. W. A. Richards is in charge of this office.

The McCabe & Sheeran Machinery Corporation announces its assignment to liquidate the plant and machine tool equipment of the Cooke Works of the American Locomotive Co., at Paterson, N. J. Over five hundred machines are included in the proposed sale.

The Air Reduction Co., Inc., of New York, has acquired the plant and business of the Dayton Oxygen and Hydrogen Products Co., of Dayton, Ohio. The Dayton plant will furnish a new production and distribution point for Airco products, making a total of fifty-two such plants now under Airco control in this country.

The Gisholt Machine Co., of Madison, Wis., has opened an office in the General Motors Bldg., Detroit. U. S. James, who has been the company's special factory representative in Detroit, will be in charge of this office. He will be assisted by F. M. Long, A. S. Beckman, E. L. Addleton and Wallace S. Salmon.

The Athol Pump Co., of Athol, Mass., was recently acquired by the Leavitt Machine Co., of Orange, Mass. The Athol company is headed by Edgar A. Fletcher, and was established by his father in 1863. The company manufactures pumps and plumbers' supplies. No change is to be made in the location or nature of the business.

Two engineers, representative of the commissariat of communication of the Union of Soviet Socialist Republics have arrived in Canada for the purpose of buying railway cars and automatic couplers and brakes for Russian railway equipment. They are M. B. Baronsky, assistant chief of motive power and rolling stock, and E. I. Vanderguecht, assistant chief engineer of the same department.

Dayton-Dunbar, Inc. has been organized and offices have been established at 149 Broadway, New York. Paul Dayton has been New York representative for the Reed-Prentice Co., Wade Tool Co., Cincinnati Electric Tool Co., and several other companies. Mr. Dunbar was for eleven years New York manager of the Landis Tool Co. The new organization will handle a special and standard line of tools and shop equipment.

Announcement is made of the formation of Robert J. Anderson, Inc., to operate as a commercial testing laboratory, specializing in metals and alloys. The new laboratory, which is situated at 2416-38 Beekman St., Cincinnati, is equipped for chemical analysis, mechanical testing, metallography, heat-treatment, and radiography. Officers of the company are Dr. Robert J. Anderson, president; H. J. Hater, treasurer; R. T. Mesker, secretary. These with John Eckerle and E. F. Eckerle form the incorporators and directors.

The Winchester Repeating Arms Co., of New Haven, Conn., has contracted to manufacture the cartridge output of the United States Cartridge Co., of Lowell, Mass. As soon as convenient the machinery at the Lowell plant will be moved into factory buildings of the Winchester company at New Haven, which have been out of use since the World War. The change is in no way a sale of one company to the other. To the contrary the United States Cartridge Co. will continue to market its products under the same name and through the same channels as previously.

The W. N. Matthews Corporation, of St. Louis, announces the following additions to its mechanical painting equipment sales organization: W. W. Rhodes, Los Angeles; R. L. Stevens, Seattle, Wash.; Wayne C. Thomas, Salt Lake City; O. H. Davidson Equipment Co., Denver; George M. Gerew, Chicago; A. A. Probeck, Detroit; C. H. Ford, Philadelphia; William Brewster, New York; C. W. Moore, Atlanta; C. A. Weego, Tulsa, Okla.; R. A. Simons, St. Louis; Thomas R. Lloyd, Cleveland; and J. D. Waldron, Cincinnati. Each of these representatives has available stocks of equipment for servicing and for meeting urgent needs. A European office has been established at 114 Union St., Glasgow, Scotland, in charge of John H. Innes & Co.

A reorganization of the engineering department of the South Philadelphia Works of the Westinghouse Electric and Manufacturing Co. has just been announced. The resulting change in personnel, which will take effect immediately, includes the promotion of four engineers. W. B. Flanders, formerly engineer, large turbine division of the engineering department, has been appointed assistant manager of engineering. R. C. Allen, formerly assistant to chief engineer, has been appointed manager of large turbine engineering. J. A. MacMurchy, formerly engineer, small turbine division, has been appointed manager of small turbine engineering. D. W. R. Morgan, formerly engineer, condenser division, has been appointed manager of condenser and internal combustion engineering.

Plans are being formulated for the organization of the Long Security Lock Co., at Hartford, Conn., to manufacture commercial locks for safe deposit vaults, strong boxes, cash registers, etc. The product of the proposed company will be largely confined to locks invented by George A. Long, president of the Gray Telephone Pay Station Co. also of Hartford. The new company is to be something in the nature of a subsidiary of the Gray company to manufacture these special commercial locks and will have all the advantage and experience of the older organization. Some of the locks are already being manufactured by the Gray company. A committee has been named to take further steps in the organization procedure, and is made up of the following men: George A. Long, Ralph L. Soby, Fred L. Bishop, Ferdinand Richter and Frederick S. Bliss.

Calendar of Local Meetings

National Association of Cost Accountants

Boston Chapter. Nov. 18, national officers night.

Buffalo Chapter. Nov. 18. Subject: "Credit via the Balance Sheet," and "Insurance—Cost and Distribution," by W. F. Chase and Frank Vockrodt.

Cleveland Chapter. Nov. 17. Subject: "Defects in the Monthly Profit and Loss Statement," by W. B. Castenholz.

Detroit Chapter. Oct. 28. Subject: "Administrative and Selling Costs," by James H. Barrett.

Detroit Chapter. Nov. 18. Subject: "Financial Control Policies of the General Motors Corporation," by Albert Bradley.

Erie Chapter. Nov. 15. Subject, "Fixed Asset Depreciation and Cost."

Hartford Chapter. Nov. 16. Subject: "Departmental Co-operation Within the Organization," and visit to plant of the Colts Patent Fire Arms Manufacturing Co.

Hawaii Chapter. Nov. 23. Subject: "Problem of Business Forecasting," by Prof. G. R. Kinnear, University of Hawaii.

Kansas City Chapter. Nov. 15. Subject: "Budgeting."

Los Angeles Chapter. Nov. 16. Subject: "Mechanical Devices in Cost Accounting."

Milwaukee Chapter. Nov. 18. Subject: "Standard Costs," by E. A. Camman.

New York Chapter. Nov. 9. Subject: "Accounting Procedure for Standard Costs," by E. A. Camman.

Philadelphia Chapter. Nov. 19. Subject: "New Uses of Insurance," by Dr. S. S. Huebner.

Pittsburgh Chapter. Nov. 17. Subject: "Cost Accounting in Relation to Establishment of Rates and Selling Prices," by W. C. Wright.

Providence Chapter. Nov. 11. Subject: "Problems in Textile Costs," by C. W. Bennett.

Rochester Chapter. Oct. 28. Subject: "Consolidations, Mergers and Refinancing," by C. W. Miller.

Rochester Chapter. Nov. 17. Subject, "Payroll Analysis," by C. F. Brown.

St. Louis. Nov. 16. Subject to be announced later. Speaker—C. M. Doisseau.

San Francisco Chapter. Nov. 22. Subject: "Cost Accounting for Special Services as an Aid to Management."

Springfield Chapter. Nov. 17. Subject: "Development and Installation of Budget Systems," by H. N. Sweet.

Syracuse Chapter. Nov. 15. Subject: "Setting the Selling Price," by H. G. Crockett.

Twin Cities Chapter. Nov. 16. Subject: "The High Cost of Distribution."

Utica Chapter. Nov. 15. Subject: "Inventories," by C. M. Finney.

Worcester Chapter. Nov. 11. Subject: "Government Budgetary Control and Costs."

American Society of Mechanical Engineers

Buffalo. Oct. 26. Hotel Statler. Joint Management Week Meeting.

Lincoln. Oct. 25. Joint meeting with the Engineers' Club of Lincoln, Nebraska. Subject: Management.

Tulsa. Oct. 29. Hotel Mayo, Tulsa, Okla., Subject: "Elimination of Waste in the Refining Industry."

Philadelphia. Nov. 23. Power Meeting, Speaker, N. E. Funk.

Chicago. Oct. 27. Sherman House. Management Week meeting.

Forthcoming Meetings

American Iron and Steel Institute. Fall meeting, Hotel Commodore New York, Oct. 22. E. A. S. Clarke, secretary, 40 Rector St., New York City.

Management Week. National observance, Oct. 25 to 30. General theme—"Progress in Waste Elimination." Organizations co-operating are the American Society of Mechanical Engineers, American Management Association, American Institute of Accountants, Society of Industrial Engineers and the Taylor Society.

National Safety Council. Fifteenth annual safety congress, Detroit, Mich., Oct. 25 to 29. A. A. Mowbray, director, 108 East Ohio St., Chicago.

American Welding Society. Eighth annual fall meeting, in conjunction with International Welding and Cutting Exposition, Broadway Auditorium, Buffalo, N. Y., Nov. 16 to 19. Secretary's headquarters, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Fifth event, Grand Central Palace, New York City, Dec. 6 to 11. I. E. Moultrop, chairman advisory committee, Edison Electric Illuminating Co., Boston, Mass.

National Founders Association. Thirtieth annual convention, Hotel Astor, New York, Nov. 17 and 18. J. M. Taylor, secretary, 29 South La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, New York City, Dec. 6 to 9. Details later. Calvin Rice, secretary, 29 West 39th St., New York.

American Association for the Advancement of Science. Annual meeting, University of Pennsylvania, Philadelphia, Pa., Dec. 27 to Jan. 1. Sam Woodley, executive assistant, Smithsonian Institution, Washington, D. C.

Society of Automotive Engineers. Annual meeting, Detroit, Jan. 25 to Jan. 28. W. Delchamps, chairman, meetings and sections departmment, 29 West 39th St., New York.

The Weekly Price Guide

Rise and Fall of the Market

PIG-IRON sales continue in small lots with prices holding firmly at Pittsburgh and Birmingham. The present upward tendency in coke may soon affect iron quotations and in turn cause further hardening of steel prices. Current steel demand runs largely to railway and construction material and pipe. Steel sheets and tin plate are moving in better volume. Fabricated brass and copper prices tend downward, the same being true of non-ferrous metal scrap. Virgin metals (non-ferrous) display firmness with strong upward tendencies, particularly in tin.

(All prices as of Oct. 15)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.19
Northern Basic	20.39
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	28.67
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.75
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.05
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	19.76
Basic	19.76
Bessemer	19.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.25
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse: also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.30@2.40	3.50	3.15	3.89
No. 12	2.35@2.45	3.55	3.20	3.94
No. 14	2.40@2.50	3.60	3.25	3.99
No. 16	2.50@2.60	3.70	3.35	4.09
Black				
Nos. 18 to 20	2.80@3.00	3.75	3.50	4.15
No. 22	2.95@3.15	3.90	3.65	4.30
No. 24	3.00@3.20	3.95	3.70	4.35
No. 26	3.10@3.30	4.05	3.80	4.45
No. 28	3.25@3.45	4.20	3.95	4.60
Galvanized				
No. 10	3.15@3.25	4.10	3.85	4.40
Nos. 12 to 14	3.25@3.35	4.20	3.95	4.50
No. 16	3.35@3.45	4.30	4.05	4.60
No. 18	3.50@3.60	4.45	4.20	4.75
No. 20	3.65@3.75	4.60	4.35	4.90
No. 22	3.70@3.80	4.65	4.40	4.95
No. 24	3.85@3.95	4.80	4.55	5.10
No. 26	4.10@4.20	5.05	4.80	5.35
No. 28	4.35@4.45	5.30	5.05	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — Decimal	B.W.G. and Fractions	Outside Diameter in Inches — ⅛	¼	⅜	½	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
120″ or 125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛, 8.35c.; ¼, 7.85c.; ⅛ to ½, 7.35c. per lb. *Flat, ⅛@¼-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.50
Tin, 5-ton lots, New York			73.25
Lead (up to carlots) E. St. Louis	8.12½	New York	8.37½
Zinc (up to carlots) E. St. Louis	7.32½	New York	8.25

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	16.50	20.50	15.00
Copper sheets, base	22.75	22.75	23.00
Copper wire, base	19.75	19.75	20.00
Copper bars, base	22.37½	22.37½	22.50
Copper tubing, base	24.75	24.75	25.00
Brass sheets, base	19.12½	19.12½	19.37½
Brass tubing, base	24.00	24.00	23.75
Brass rods, base	16.87½	16.87½	17.12½
Brass wire, base	19.62½	19.62½	19.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	27.00	27.00	27.02
Zinc sheets (casks)	13.25	13.05	12.01
Solder (½ and ½), (case lots)	43.62½	44.00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			91.00
Commercial genuine, intermediate grade			63.00
Anti-friction metal, general service			32.50
No. 4 babbitt (f.o.b.)			14.50
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00 Electrolytic 39.00 Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.12½@12.37½	11.50	11.25@11.75
Copper, heavy, and wire	11.37½@12.00	11.75	10.50@11.00
Copper, light, and bottoms	9.87½@10.12½	10.00	9.50@10.00
Heavy lead	7.00 @ 7.25	7.25	6.75@ 7.25
Tea lead	5.25 @ 5.50	5.25	5.75@ 6.25
Brass, heavy, yellow	6.75 @ 7.00	7.50	7.00@ 7.50
Brass, heavy, red	9.25 @ 9.50	9.75	9.00@ 9.50
Brass, light	5.87½@ 6.12½	6.50	6.25@ 6.75
No. 1 yellow rod turnings	8.00 @ 8.25	8.25	7.50@ 8.00
Zinc	4.25 @ 4.50	4.50	4.00@ 4.50

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.18	$0.15@0.20
Cotton waste, colored, per lb.	.10@ .14	.14	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	15
Sal soda, per 100 lb. keg	2.05	2.25	2.75*
Roll sulphur, per 100 lb.	2.70†	3.50	4.25‡
Linseed oil, per gal., 5 bbl. lots	.85½	.98	88
Lard cutting oil, 25% lard, per gal.	.55	50	48
Machine lubricant, medium-bodied (55 gal. metal bbl.), per gal.	.35	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*Per 175 lb. keg. †In 150-lb. bags. ‡Per 425 lb. barrel.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb	.04	.04	0415
Brass rods	per lb	.1687½	.1712½	1687½
Solder (½ and ½)	per lb.	.4362½	.4112½	395
Cotton waste	per lb.	13@ 17½	13@.17½	15@22
Washers, cast iron (⅛ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	55	.55	55
Machine oil	per gal.	35	.35	35
Belting, leather, medium	off list	40–5%	40–5%	40%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$5.65
Emery paper	10.71	11.00	10.71
Emery cloth	27.84	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.45	1.49
Cloth	3.10	3.50	3.75
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.50@ 3.75
Coke, prompt foundry, Connellsville	per net ton		4.25@ 5.00
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16.75	

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%

Carriage bolts, ¼x1½-in., per 100, $1.00 Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1¼ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c.

Washers, cast iron, ⅛-in., $7.00* per 100 lb. at New York warehouses; ¼-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ill., Chicago—Dept. of Public Works, A. A. Sprague, Comr.—will receive bids until Oct. 25 for two engine lathes for water meter shop.

Ill., Chicago—Johnson Shuttle Co., J. W. Johnson, Mgr., 215-17 West Superior St.—additional tools and equipment (later) for proposed 1 story, 75 x 122 ft. addition to factory for the manufacture of sewing machine parts.

Ill., Chicago—Nye Tool & Machine Co., 4120 Fullerton Ave.—additional tools and equipment (after Jan. 1) for the manufacture of pipe stocks and dies, pipe cutters, pipe vices, etc., for proposed 1 story, 100 x 100 ft. addition to plant.

Ill., Granite City—St. Louis Coke & Iron Corp.—one gantry crane.

Mass., Roxbury (Boston P.O.) — M. Markovsky, 24 Kenwood St., Dorchester—miscellaneous tools and equipment for proposed repair and service garage here. Estimated cost $60,000.

Mass., Waltham (Boston P.O.)—The Wal-Grinding Wheel Co., 115 Bacon St.—additional equipment for proposed extension to factory.

Minn., Minneapolis — The Electric Machinery Mfg. Co., 1331 Taylor St., N. E. (synchronous motors, alterators and automatic starters) testing, impregnating and baking equipment for proposed 2 story, 40 x 110 and 26 x 52 ft. addition to plant.

Mo., Kansas City—Hurst Scrap Iron & Metal Co., 8 West 10th St.—foundry equipment including molding machine, dyes, presses, etc., for proposed addition to plant.

Mo., Valley Park—Barbour Metal Boat Co.—¼ in. splitting shear.

N. Y., Brooklyn—Karp Metal Products Co., 129 30th St.—4 power presses with overhang at least 8 in. from center to back, 30 in. between housings, also 8 surface plates.

O., Cleveland—F. Laurich, 1173 East 58th St.—heavy knife and shear grinder.

O., Cleveland — Otis Steel Co., E. J. Kulash, Pres., 3341 Jennings Rd., cranes, ladles and door operators for proposed 1 story, 84 x 160 ft. open hearth furnace. Estimated cost $300,000.

Wis., Milwaukee—Special Stamping & Mfg. Co., C. J. Hendricks, 1504 First National Bank Bldg.—stamping presses.

Wis., Milwaukee—Vollbrecht Cut Stone Co., 16th and Canal Sts.—electric crane.

Wis., Racine—Standard Foundry Co., 1600 Kewaunee St., A. R. Janes, Pres.—moulding machines and crane.

Wis., Waupun—Althouse-Wheeler Co.—moulding machines for proposed 1 story, 40 x 80 ft. foundry. Estimated cost $25,000.

Opportunities for Future Business

Calif., Los Angeles—Chapman Bros. Co., West 6th St., will receive bids about Nov. 8 for the construction of a 6 story, 90 x 275 ft. garage. Estimated cost $300,000. R. H. Orr, 1305 Corporation Bldg., Archt. Noted Aug. 26.

Calif., Los Angeles—May Co., 800 Hill St., plans the construction of a 4 story, 145 x 153 ft. garage at 9th and Hill Sts. Estimated cost $500,000. Curlett & Beelman, 408 Union Bank Bldg., Archts.

Calif., San Jose—Pacific Gas & Electric Co., J. D. Kuster, Div. Mgr., 245 Market St., San Francisco, had plans prepared for the construction of a machine shop here. Estimated cost $15,000. Private plans.

Ill., Chicago—The Butler Street Foundry & Iron Co., 3424 Normal Ave., awarded contract for rebuilding 1 story, 60 x 267 ft. assembly plant recently destroyed by fire. Estimated cost $50,000.

Ill., Chicago — Central Mfg. Dist., 38 South Dearborn St., has work underway on the construction of a 125 x 320 ft. factory at Pershing Rd. and Hermitage Ave. Auto Car Sales & Service Co., 913 West Jackson Blvd., lessee.

Ill., Peoria—E. C. May, Peoria Life Bldg., awarded contract for the construction of a 3 story, 144 x 173 ft. garage on Madison Ave. Estimated cost $150,000.

Mass., Boston — Commercial Building Corp., c/o R. A. Nordbloom, 79 Milk St., is receiving bids for the construction of a 3 story garage on Commonwealth Ave. Estimated cost $200,000. W. A. Dykeman, 15 Exchange St., Archt.

Mass., Boston—Pierce Arrow Co., 888 Commonwealth Ave., is receiving bids for the construction of a 3 story, 100 x 300 ft. sales and service station at Commonwealth Ave. and Alcorn St., Estimated cost $400,000. H. C. Cook, 408 Pearl St., Buffalo, N. Y., Archt. Noted Sept. 30.

Mass., Billerica—Boston & Maine R.R., North Station, Boston, awarded contract for the construction of a 1 story boiler shop here. Estimated cost $40,000.

Mass., Cambridge (Boston P.O.)—M. L. Glassman, Columbia St., is having plans prepared for the construction of a 1 and 2 story automobile dismantling shop at Columbia St. and Webster Ave. Estimated cost $40,000. N. Douglas, 393 Broadway, Archt.

Mass., Dorchester (Boston P. O.) — Thompson Wire Co., 41 Mildred Ave., awarded contract for the construction of a 1 story, 65 x 150 ft. addition to factory. Estimated cost $40,000.

Mass., Lynn—Thomson Electric Welding Co., 161 Pleasant St., will build a 1 story addition to factory. H. M. Haven & A. T. Hopkins, 11 Beacon St., Boston, Engrs. Noted Sept. 9.

Mass., Newton (Boston P.O.)—N. T. Turner, 69 Elmwood St., is receiving bids for the construction of a 2 story garage and repair shop on Washington St. Estimated cost $50,000. Brainard & Leeds, 89 Franklin St., Boston, Archts. Noted Sept. 2.

Mass., Rutland—Central New England Sanatorium, awarded contract for the construction of a 2 story workshop on Miles Rd. Estimated cost $60,000. Noted Aug. 26.

Mass., Springfield—Perfection Grate & Supply Co., 164 Birnie Ave., plans the construction of a 1 story addition to foundry. Estimated cost $40,000. Private plans.

Mass., Watertown (Boston P. O.)—Arden Box Toe Co., 36 Pleasant St., is having plans prepared for the construction of two 1 story, 50 x 100 ft. factory buildings on Arlington Sts. Private plans.

Mo., St. Louis—The Medart Mfg. Co., 3500 De Kalb St., awarded contract for the construction of a 1 story, 110 x 300 ft. foundry. Estimated cost $50,000.

Mo., St. Louis—Swift & Co., 33 South Clark St., Chicago, Ill., awarded contract for the construction of a 1 story, 100 x 102 ft. mechanical shops for packing plant at 800 South Vandeventer Ave., here.

N. H., Exeter—D. S. Kimball, c/o Butterfield-Buerton Co., 801 Beech St., Manchester, Archt., awarded contract for the construction of a 1 story, 70 x 100 ft. repair and service garage. Estimated cost $40,000.

N. H., Portsmouth—Hobbs Motor Co., is receiving bids for the construction of a 1 story repair and service garage. Estimated cost $50,000. Dow, Harlow & Kimball, 184 Boylston St., Boston, Mass., Archts.

O., Cleveland—American Steel & Wire Co., Rockefeller Bldg., awarded contract for the construction of a 1 story addition to plant at River Rd. and Broadway. Estimated cost $75,000.

O., Cleveland—Fisher Body Ohio Co., F. Fisher, Pres., General Motors Bldg., Detroit, Mich., awarded contract for the construction of a 2 story, 80 x 200 ft. warehouse, 1 story, 50 x 400 ft. press shop, etc. on East 140th St. here.

O., Cleveland—New York Central R.R. Co., 466 Lexington Ave., New York, N. Y., will soon award contract for the construction of 1 story, 25 x 200 ft. car repair shops on East 152nd St., here. Estimated cost $60,000. G. W. Kittredge, Ch. Engr.

O., Cleveland—The River Cliff Co., R. A. Teshera, 19520 Frazier Dr., awarded contract for the construction of a 1 story, 62 x 121 ft. garage on Lake Rd. Estimated cost $75,000.

O., Columbus—Dept. of Public Works & Highways, G. F. Schlesinger, Dir., will soon award contract for the construction of a 2 story, 80 x 200 ft. garage and repair shop. H. B. Briggs, Ohio-Hartman Bldg., Archt. Noted May 27.

O., Columbus—H. M. Freck, 176 South Pearl St., awarded contract for the construction of a 2 story, 125 x 134 ft. repair and service garage on Front St. Estimated cost $85,000. Herz Driveurself Co., lessee. Noted Sept. 2.

O., Dayton—U. S. Government Air Service, E. M. George, Constructing Quartermaster, Wright Field, awarded contract for the construction of an assembly plant on Wright Field. Estimated cost $216,000.

O., Fostoria—National Carbon Co., c/o D. R. Shock, Engr., West 117th St. and Madison Ave., Cleveland, awarded contract for foundations for a group of manufacturing buildings here.

O., New Philadelphia—Dept. of Public Works & Highways, Ohio and Hortman Bldg., Columbus, is receiving bids for the construction of a 1 story, 80 x 120 ft. repair and service garage. Estimated cost $60,000. H. B. Briggs, Ohio and Hartman Bldg., Archt. Noted Jun. 24.

Pa., Beaver Falls — Ingram Richardson Mfg. Co., manufacturers of enameled iron signs, plans the construction of a 1 story, 96 x 122 ft. addition to factory. J. E. Martsolf, New Brighton, Archt.

Pa., Canonsburg—Continental Can Co., will soon receive bids for the construction of a 2 story, 80 x 100 ft. addition to factory. Estimated cost $80,000. Francisco & Jacobus, 511 5th Ave., New York, N. Y., Archts.

Pa., Johnstown—B. Hendler, Washington St., plans the construction of a 5 story, 85 x 125 ft. garage on Locust St. Estimated cost $150,000. Architect not selected.

Pa., Philadelphia — Mashbaum Bros. & Fleisher, 1432 South Pennsylvania Sq., plans the construction of a 3 story, 108 x 114 ft. garage at Juniper and Cherry Sts. Hoffman-Henon Co., Finance Bldg., Archts.

Pa., Shire Oaks (Elrama P.O.)—Pennsylvania R.R. Co., Broad St. Station, Philadelphia, awarded contract for the construction of 78 x 118, 60 x 100 and 46 x 48 ft. shop buildings all 1 story here. Estimated cost $200,000. Noted Oct. 7.

Tex., Harlingen — Missouri Pacific Ry. Co., Railway Exchange Bldg., St. Louis, Mo., is having surveys made for improvements to engine repair shops, etc., here. Estimated cost $500,000.

Wis., West Allis—Pioneer Mfg. Co., 526 62nd Ave., manufacturers of power cultivators, awarded contract for the construction of a 1 story, 62 x 120 ft. factory on 74th Ae. Estimated cost $40,000.